SEPTEMBER 1954

PRECISION METAL MOLDING

INCLUDING DIE CASTINGS MAGAZINE

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POWDER METALLURGY
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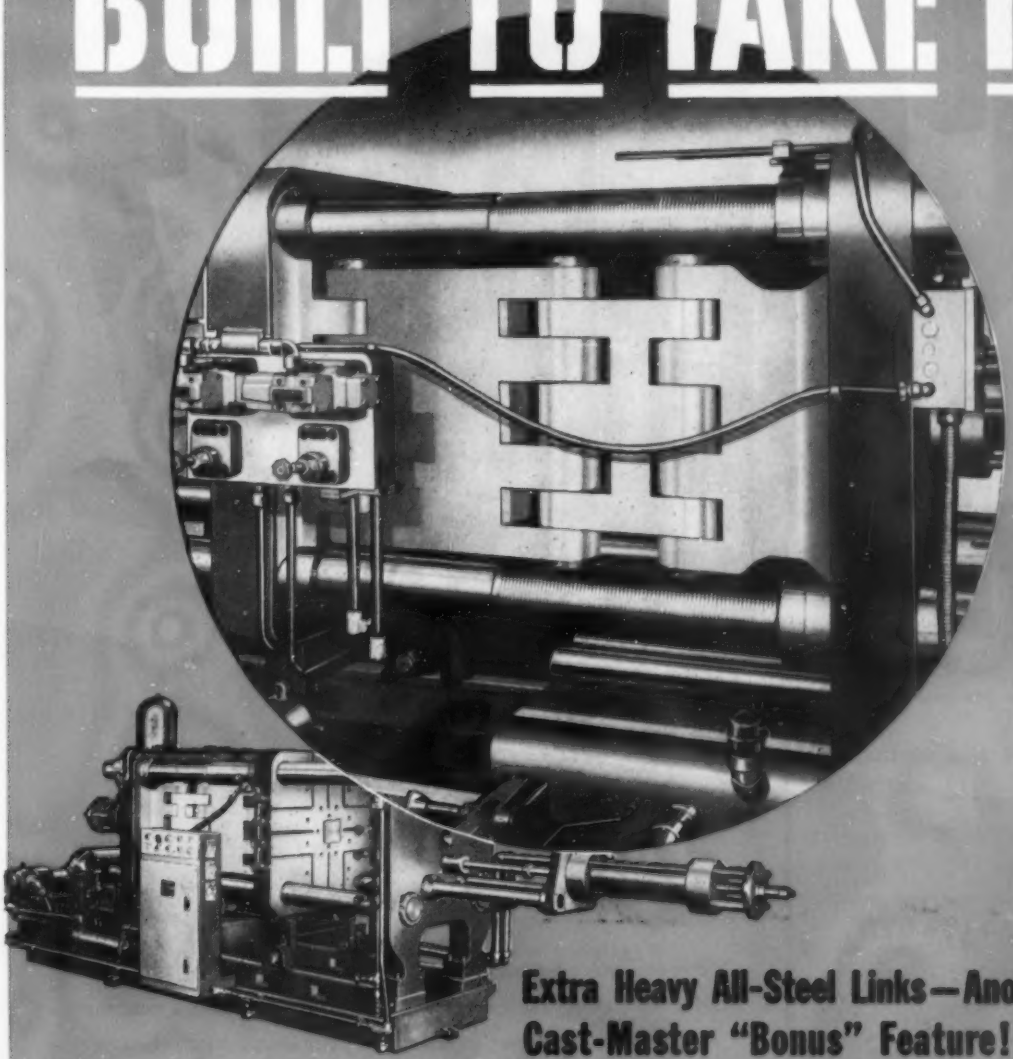

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SEPTEMBER, 1954

Volume 12 Number 9

PRECISION METAL MOLDING

DIE CASTINGS • INVESTMENT CASTINGS • PLASTER MOLD CASTINGS

PERMANENT MOLD CASTINGS • POWDER METALLURGY • SHELL MOLDINGS

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And at sound-barrier speeds, a revolutionary bailout technique had to be found.

So engineers at Stanley Aviation Corp., Buffalo, N.Y., developed an ejection seat that catapults **downward** from a plane and a lap belt that automatically opens, frees the airman from the seat, and sequences parachute opening.

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Letters to the editor

MOLD COSTS?

We have read with considerable interest the article covering the plaster mold casting process in the June 1954 issue of "Precision Metal Molding".

We have an application for casting by this method, but are skeptical as to the mold costs involved in view of the mold being good for only one casting. Our metal composition is an 85-5-5-5 brass material, and we been given to the use of ceramic or cement (Illuminite) molds.

Should there have been any other articles written on permanent molding that you feel would help us, we would appreciate your letting us know such that we might obtain copies. Should any have appeared in past issues of your magazine, kindly forward tear sheets and invoice us accordingly.—J. D. G. (Metallurgical Engineer).

Perhaps reader J. D. G. does not appreciate that while the mold is destroyed in each cycle, the pattern is not, as in sand casting. It then becomes a matter of individual cost comparison whether the expense of the brass pattern for plaster mold casting, or a steel mold for permanent mold casting, is more economical for the number of pieces to be produced. Also, in semi-permanent mold casting, an expendable sand core is used in each cycle, which is another factor to be considered.

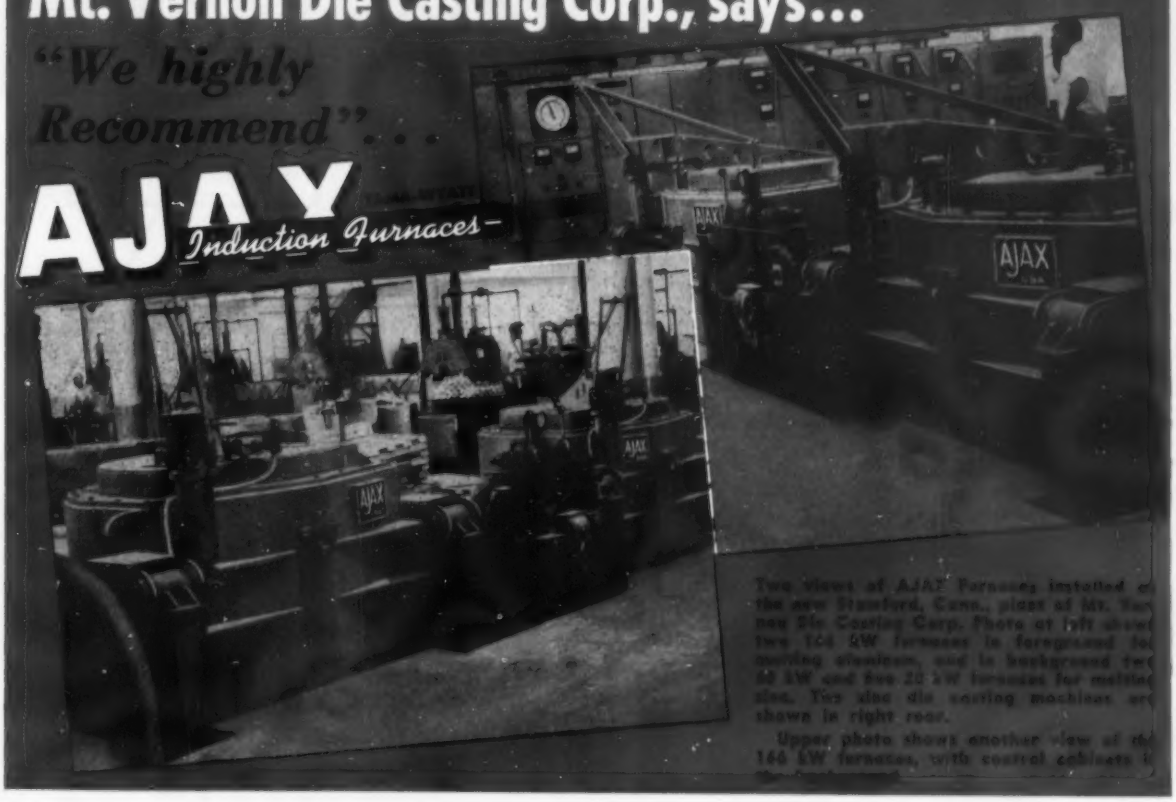
Dependable sources have been suggested for each type of casting, and the quotations on piece costs, tool costs and other factors such as delivery dates, etc., should help in finding the optimum production method.—Ed.

Continued on page 10

Mt. Vernon Die Casting Corp., says...

"We highly Recommend"...

AJAX Induction Furnaces—



Two views of AJAX Furnaces installed at the new Stamford, Conn., plant of Mt. Vernon Die Casting Corp. Photo at left shows two 166 kW furnaces in foreground for melting aluminum, and in background two 40 kW and five 20 kW furnaces for melting zinc. Two zinc die casting machines are shown in right rear.

Upper photo shows another view of the 166 kW furnaces, with control cabinets in

After a most satisfactory experience of more than five years with AJAX ***low frequency*** Induction Furnaces in their Mt. Vernon, New York plant, this company has now installed the furnaces shown above in their new modern plant at Stamford, Conn. "We are convinced," they state, "that economy of operation make this type of furnace well worth while. We intend to continue to install them till all our die casting machines are fed by AJAX furnaces."

ALL ALUMINUM alloy at Mount Vernon is melted in a central group of AJAX melting furnaces. Small individual AJAX holding furnaces serve many ALUMINUM die casting machines.

ALL ZINC die casting alloy is prepared from pure metals in another group of AJAX melting furnaces. AJAX holding furnaces serving all ZINC die casting machines are supplied through an AJAX-engineered molten ZINC distribution system requiring no labor.

Years of practical experience with AJAX induction equipment enabled Mount Vernon Die Casting Corporation to take full advantage of this up-to-date method of melting in their new plant. The result is outstanding production efficiency and quality control.

We at AJAX Engineering are proud to have played a part in this achievement.

Write for Reprint of New Article Featuring This Installation

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AJAX TAMA-WYATT

INDUCTION MELTING FURNACE

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AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
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The most ever offered in a

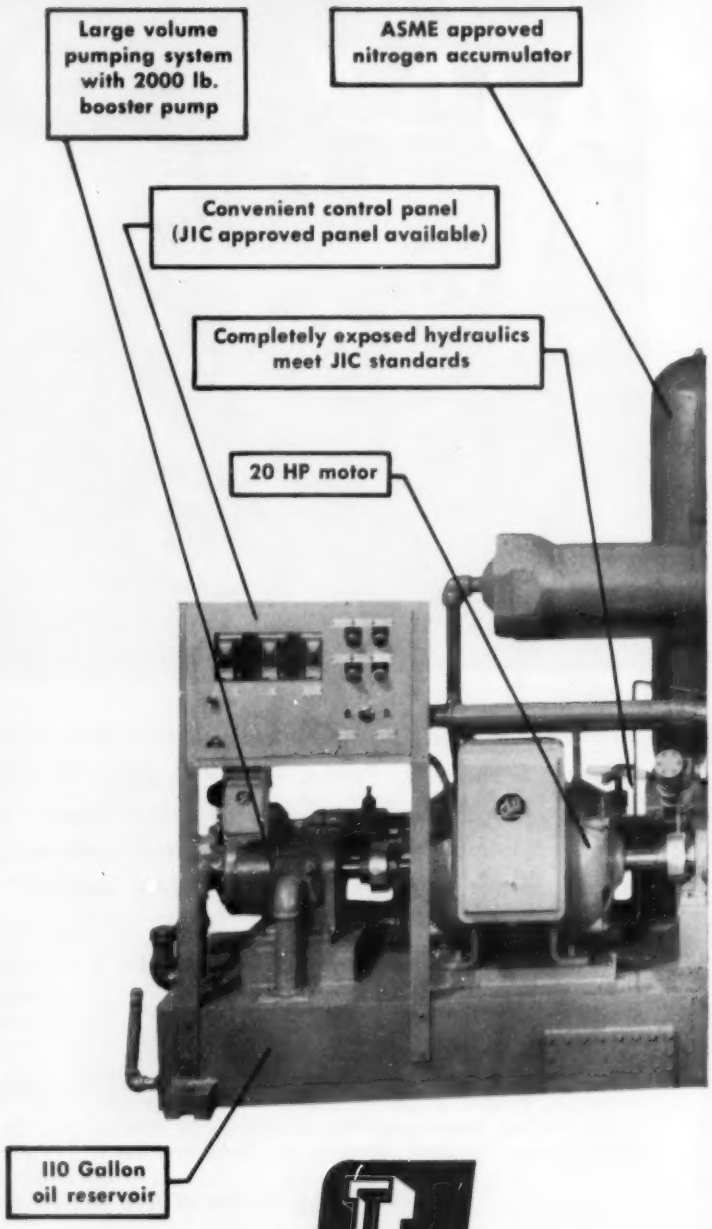
The LESTER-PHOENIX HP-2½X-SF for ALUMINUM DIE CASTING

Now that this new Lester has taken its place in the industry, the conception of a 400 ton die casting machine will have to be revised upward. The HP-2½X-SF has size, shot capacity, speed and unusual ruggedness that makes it—on the basis of any comparison, including price—the leader in its class.

The backbone of this exceptional machine is the solid steel frame assembly which, combined with the massive toggle links, develops 400 tons of clamp—based not on designer's calculations, but on actual strain gauge tests! This basic structure, in turn, permits all of the outstanding features shown here.

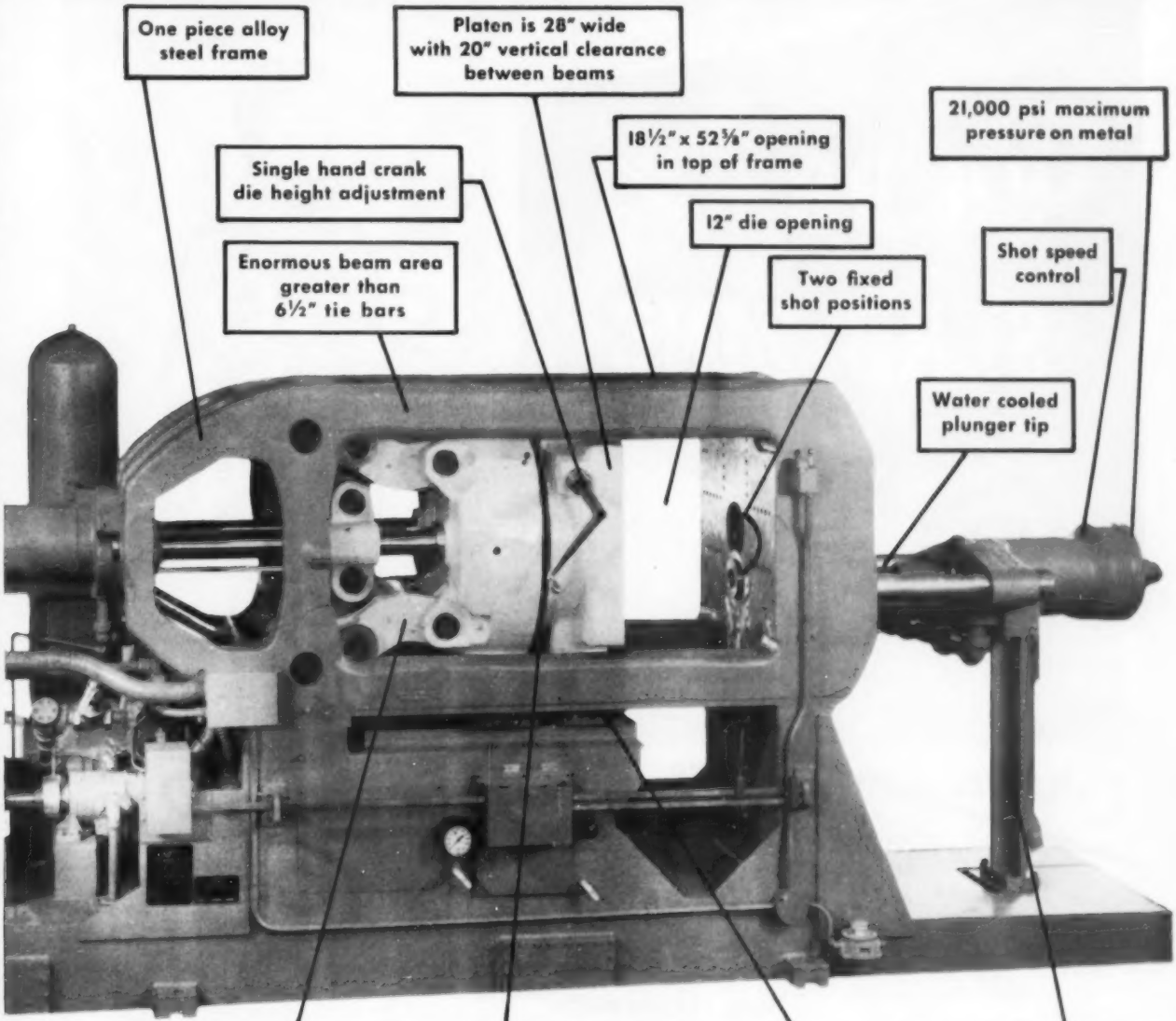
And there are many more: ranging from automatic hydraulic ejection to convertibility to zinc die casting. For complete specifications write today to Lester-Phoenix, and also ask for regular copies of our house organ, "The Lester Press".

The HP-2½X-SF is also offered with the Pre-Fill injection system, increasing maximum shot pressure to 32,000 psi and also increasing shot speed.


Large volume pumping system with 2000 lb. booster pump
ASME approved nitrogen accumulator
Convenient control panel (JIC approved panel available)
Completely exposed hydraulics meet JIC standards
20 HP motor
110 Gallon oil reservoir

LESTER-

400 Ton die casting machine


One piece alloy steel frame
Platen is 28" wide with 20" vertical clearance between beams
21,000 psi maximum pressure on metal
18½" x 52⅜" opening in top of frame
Single hand crank die height adjustment
12" die opening
Shot speed control
Enormous beam area greater than 6½" tie bars
Two fixed shot positions
Water cooled plunger tip
High speed double toggle linkage with hardened steel bushing and pins throughout
Platen bolstered by large diameter adjusting screw
Platen supported on hardened steel gibs can't tip or sag
Rigidly supported shot assembly

PHOENIX DIE CASTING MACHINES

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Detroit	Thoreson-McCosh	Cincinnati	Index Machinery Corp.
Chicago	J. J. Schmidt	Los Angeles	Seaboard Machinery Co.
Cleveland	Don Williams	San Francisco	J. Fraser Rae
Coral Gables	Morton Machinery Sales	St. Louis, Milwaukee	A. B. Geers

FOREIGN

Toronto, Canada	Modern Tool Works, Ltd.
Sydney, Australia	Scott & Holladay, Ltd.
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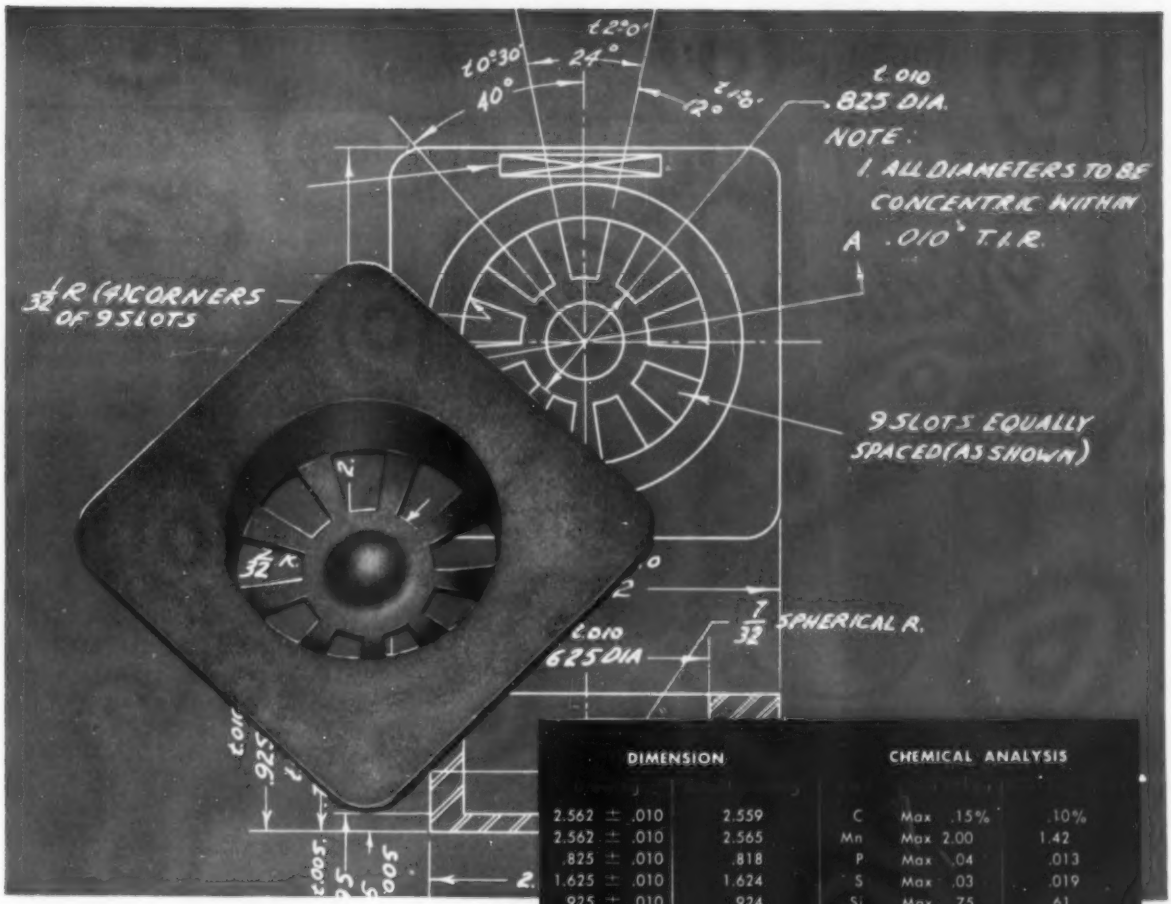

DIMENSION		CHEMICAL ANALYSIS		
2.562 ± .010	2.559	C	Max .15%	.10%
2.562 ± .010	2.565	Mn	Max 2.00	1.42
.825 ± .010	.818	P	Max .04	.013
1.625 ± .010	1.624	S	Max .03	.019
.925 ± .010	.924	Si	Max .75	.61
.700 ± .010	.698	Ni	12.00-14.00	13.00
.105 ± .005	.109	Cr	16.00-18.00	17.70
2.050 ± .010	2.058	Cu	Max .50	.07
.295 ± .005	.293	Mo	1.50-2.25	1.96

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for dimensional and metallurgical accuracy . . .

This intricately shaped aircraft instrument part had to be held to rigid specifications both in size and in chemical analysis of the steel.

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The next time you have a job where quality and close tolerances are needed, be sure to investigate the advantages of ACCUMET precision castings – *call Crucible.*

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54 years of Fine steelmaking **ACCUMET INVESTMENT CASTINGS**

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Another tough parts problem solved

by VACUUM DIE CASTING

of Aluminum Bronze

This mixed flow fan for their G22-DC Generator, used on the Continental engine which powers the Walker Bulldog tank, had presented a "tough part problem" for Jack & Heintz, Inc.

This intricate part, with 17 vanes only .093" thick and 2½" long, required smooth surfaces for efficient cooling, high strength and balance for an operating speed of 8000 rpm, and corrosion resistance for operation in all kinds of weather, even under water. The exclusive vacuum die casting process developed by the Aurora Metal Company and an AUR-O-MET Aluminum Bronze alloy met and surpassed these requirements.

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The sound, dense, high tensile strength vacuum die casting produced the fan so it would stand up under constant tough field operation. The 7" diameter fan even withstood spin tests at 17,000 rpm.

DESIGN FREEDOM

Because of high-strength, sound, smooth castings, the fan vanes could be made to an optimum thickness with this casting method. This enabled Jack & Heintz's engineers to provide a more efficient cooling flow.

LOWER FINAL COSTS

Freedom from oxide inclusions, exclusive with the vacuum die casting process, made machining simple, fast and inexpensive. Uniformity reduced time necessary in final balancing and the smooth cast surfaces eliminated further finishing.

If you have a "tough parts problem," vacuum die casting of aluminum bronze may be your answer.

Vacuum die casting of aluminum bronze is not a cure-all, but it has proved to be the answer for a wide range of parts-production problems.

Our engineering staff's extensive experience is at your disposal. If you have a specific problem, send prints or specifications . . . we will give them our prompt attention.

Learn more about vacuum die casting in aluminum bronze. Send today for this free informative brochure.

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Aurora Metal Company

612 WEST PARK AURORA, ILLINOIS

Representatives in: New York City, Rochester, N. Y., Cleveland, Cincinnati, Detroit, Grand Rapids, Chicago, Minneapolis, Los Angeles, San Francisco and Seattle.

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LETTERS TO THE EDITOR
continued from page 4

WHO — WHERE — HOW

Do you know the names of firms which specialize in the production of inconel investment castings, i.e., firms who have experience particularly in this material In the affirmative, we would appreciate your advising us their address.—B.W.

Can you send me a list of manufacturers of low frequency induction melting furnaces for aluminum?—F.H.

We would appreciate receiving a copy of the article entitled "Design of a Metal-to-Plastic Joint That Resists Stress", by W. E. Cummings which appeared in PRECISION METAL MOLDING, v. 12, May 1954, p. 38-39, 92-93.—W.Z.B. (Vice President).

As per your article in the June issue of Precision Metal Molding, page 67, "Faster Paint Spraying With Mechanized Equipment," by C. W. Scantlebury, Engineer, Finish Engineering Co., Inc. — would you please be kind enough to send us complete information as to where we could obtain more literature, brochures, prices, etc. Also, where this machinery could be seen, if possible, in the Los Angeles area.

—B.J.A. (President).

Please send the name of the manufacturer of the cap-type push-on Speed Nuts illustrated on upper page 51 of July 1954 issue. We would like to receive their catalogue.

—P.M.W. (President).

In the July 1954 issue of Precision Metal Molding you have an article entitled, "An Economical Mold Material for Accurate Casting of Aluminum Alloys." The article was written by C. E. Herington of Meehanite Metal Corporation. The article

Continued on page 112

DIE-CAST... *believe it or not...*

at extremely low cost!

Too complicated to be die-cast? Some might think so. Yet today Eclipse-Pioneer Foundries are handling this aircraft instrument housing frame to perfection as a *production* die-casting job . . . and saving 32% in labor and burden and 97.5% in material over previous sand-casting methods.

This is only one example of how we can deliver top quality (and at low cost) in both ordinary and "impossible" die-castings of all kinds. Here are some of the advantages we offer you:

1. **LOWER FINISHING COST**—We die-cast to such close tolerances that you save machining time and money. So *final* cost . . . the only one that really counts . . . comes *down*.
2. **LIGHTER WEIGHT**—There's far less waste metal for you to machine off . . . and unmachined areas can be cast thinner for additional weight savings.
3. **BETTER FINISH**—Surfaces on unmachined parts are much smoother.
4. **VERSATILITY**—We handle magnesium or aluminum with equal facility.
5. **ANY QUANTITIES AT LOW COST**—Long runs are not necessary in order for us to effect savings for you.

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Check-Chart Shows Versatility of Eclipse-Pioneer Foundries

PROCESS USED	METAL WORKED	
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Plaster	√	√
Shell Mold	√	√
Die	√	√
Permanent Mold	√	√

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Title_____

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Zone_____ State_____

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FACTS ABOUT ATLANTALLOY PRECISION PLASTER MOLD CASTINGS

One-piece cast ice cutter for York Corporation's Automatic Ice Maker replaced fabrication of several stainless steel parts.

Cast brush holder for General Electric aircraft generators lowered costs, provided closer tolerances and increased strength.

Lever casting of *Atlantalloy* #31 manganese bronze with tensile strength of 100,000 psi for Sargent & Greenleaf's manipulation-proof lock.

Rugged skirt door operating mechanism cast for Pennsylvania Railroad cars manufactured by the Budd Company.

• ATLANTALLOY PRECISION PLASTER MOLD CASTINGS • ATLANTALLOY PRECISION PLASTER MOLD CASTINGS • ATLANTALLOY PRECISION PLAST

Today, **ATLANTALLOY CASTINGS** are used where precise dimensions and high physical values *plus* economy are essential. These unique precision plaster mold castings can improve *your* product design and reduce *your* costs:

PRECISION — Meet precision machining tolerances. Average limits, ± .005 on one side of parting line. Minimal or no machining or finishing.

DESIGN — Compared with other techniques, this casting process makes possible the production of parts which, because of high physical properties, could not economically be produced by other means. Complicated assemblies requiring several machined parts can be cast accurately as one piece, including designs having internal teeth, stops and blind gear teeth. A wide range of *Atlantalloys* are available for your design needs. Chemical certification on request.

EXCLUSIVE CASTING FEATURES — No gas formation when metal enters mold, and no ebullition of liquid metal. Self-venting molds yield to metal, cool slowly. Castings are practically stress-free with superior grain structure. Loose cores permit "impossible" designs. Finishes are exceptionally smooth and clean.

ECONOMY — Major savings in machine work because of high finish, uniformity and accuracy. End costs below machined parts from rougher-type castings, *even for limited volume runs.* Greater savings for large runs. Time and material savings since uniform castings always fit your jigs and fixtures without rejects. Tool life extended because castings have no blow holes, hard spots, or inclusions.

SALES REPRESENTATIVES

Middle Atlantic States — Beemer Engineering Co., 401 North Broad St., Philadelphia 8, Pa.

New England — J. C. Tarbel Associates, Inc., 64 Park St., Springfield 2, Mass.

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Circle No. 8 on Reader Service Card

Changes in personnel

Harley A. Coy has been elected vice president of the *American Zinc Co. of Tennessee.* **William Black** has been promoted to manager of operations, *American Zinc Co. of Tennessee.*

Bernard N. Zimmer, vice president and director of *American Metal Co., Ltd.,* will retire on June 30th.

Alan D. Dauch has been appointed vice president of sales of *Salem-Brosius, Inc.* and its recently acquired subsidiary, the *George J. Hagan Co.*

William H. Armstrong has been promoted to sales supervisor of Honite brand products for *Minnesota Mining & Mfg. Co.*

Ralph F. Burns has been appointed as manager of metals sales, Western Division for the *New Jersey Zinc Sales Co.*

Peter J. Jensen has been named manager of manufacturing at *Carboloy Dept. of General Electric Co.*

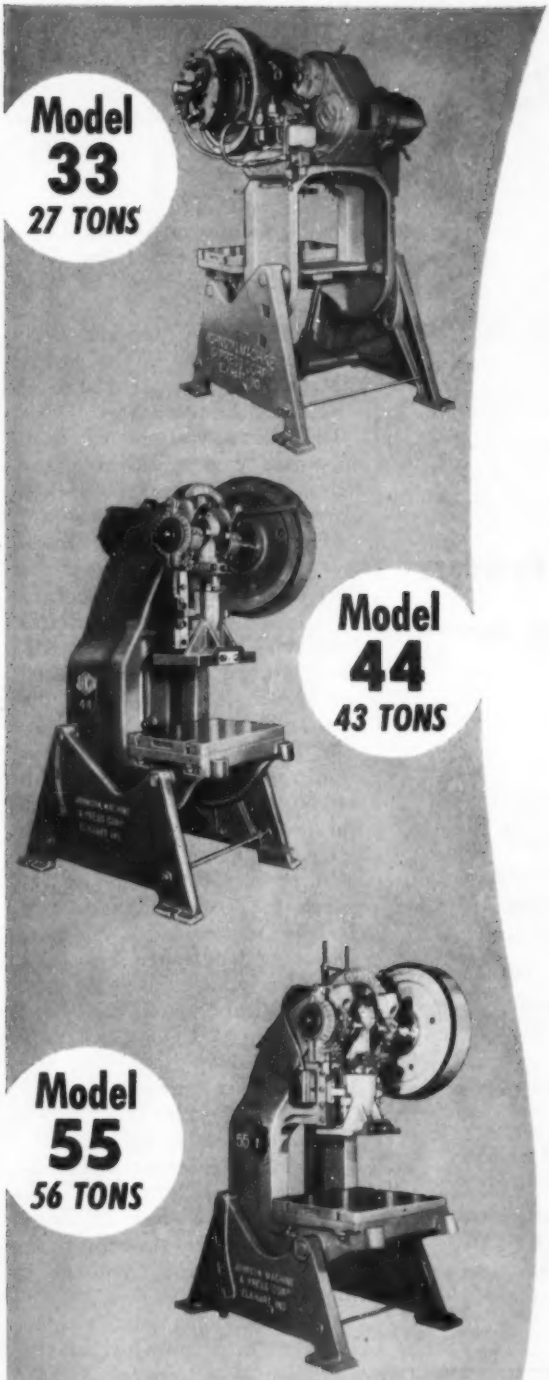
Jules F. Halm for the past fifteen years treasurer and assistant secretary of *Allied Products Corp.* has recently retired after twenty-three years service with the company. **V. Leonard Hanna** has been named the new treasurer and **Peter C. Fortune** the new assistant secretary.

Dr. Carl B. Post, chief metallurgist, has been appointed head of the metallurgical and research departments of *The Carpenter Steel Co.*

J. W. Marrinan was recently elected vice president in charge of operations of *Superior Steel Corp.*

Richard F. Graham has been made sales representative for *Hooker Electrochemical Co.* in the Wilmington, Calif. office.

Continued on page 14



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can give your compact, regardless of size —

- **Tensile strengths to 105,000 psi**
- **Sintered densities to 7.11**
- **% Elongation in 1 inch to 4.9%**
- **Rockwell hardness to B-98**

Yes, a 7.5% addition of Metal Hydrides' pre-alloyed chromium-nickel powder, plus 1% graphite to electrolytic iron powder can give your product these qualities. Check the chart below. See how easily MH chrome-nickel pre-alloyed powder can fit into your production picture, giving you volume production of high tensile, intricate parts at less cost:

	No Alloy		7.5% (20 Cr-80 Ni)		7.5% (50 Cr-50 Ni)		7.5% (80 Cr-20 Ni)	
	2012°F	2192°F	2012°F	2192°	2012°F	2192°F	2012°F	2192°F
Density, g/cc	7.05	7.12	7.02	7.11	6.95	7.10	6.74	6.63
Rockwell Hardness	B-78	B-78	B-71	B-90	B-91	B-98	B-80	B-98
Tensile Strength, psi	53000	68500	70200	83000	82700	100800	73600	105000
Elongation, % in 1"	4.2	4.0	4.9	3.4	2.7	4.6	1.8	2.2

Write for complete information now. No obligation of course.

MH

Metal Hydrides
INCORPORATED

20 CONGRESS ST., BEVERLY, MASS.

Circle No. 60 on Reader Service Card

CHANGES IN PERSONNEL

continued from page 12

N. J. Conner has been appointed manager of the New York district office of *The Babcock & Wilcox Co.*

J. B. Henry, Jr. has been named manager of the newly created architectural div. of *Allegheny Ludlum Steel Corp.*

Dr. Harry Walker has been appointed vice president of the *Norma-Hoffmann Bearings Corp., Walker Div.*

Herbert J. Reid has been appointed factory manager of the Fort Wayne plant of the mechanical goods division, *United States Rubber Co.* He succeeds **H. Leon Moran** who was named new products manager for the division.

W. Berkhardt is the new technical service representative in the Nottistown, Pa. area for *Oakite Products, Inc.*

Dr. Augustus B. Kinzel has been appointed director of research for *Union Carbide and Carbon Corp.*

George J. Fischer has been appointed as director of the Metallurgical Dept. of *Sam Tour & Co.*

G. Essendrop has been appointed office manager and manager of sales for *Rocky Mountain Metals, Inc.*, a subsidiary of the *International Powder Metallurgy Co.*

William E. Grover has been appointed as chief erection engineer for *Surface Combustion Corp.*

T. R. Gill has been elected president and member of the board of *The General Supply Co.* and *The G. S. Equipment Co.*

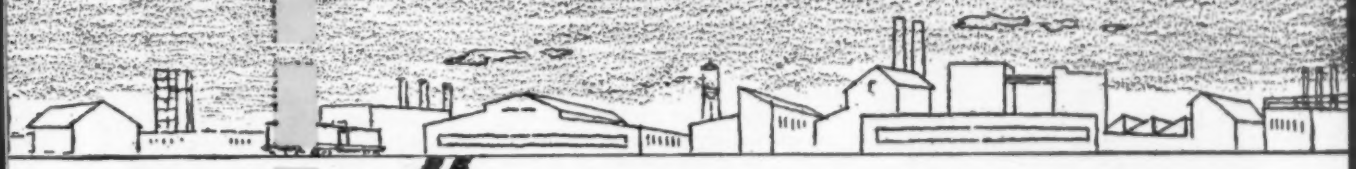
Arthur Tauscher has been appointed plant engineer in charge of maintenance and construction of *The Cooper Alloy Foundry Co.*

Eric O. Prange has been appointed sales representative for Ohio, Michigan and Indiana by *Alexander Saunders & Co.*

THE RIGHT WAY *to quality zinc die castings*

CERTIFIED ZINC ALLOY PLAN
LICENSED PRODUCER
AMERICAN DIE CASTING INSTITUTE

. . . and the way to be certain of "on grade" alloys . . . the CERTIFIED ZINC ALLOY PLAN



You're on sure ground when your die castings are made by a CZ Licensed Producer. No matter what your requirements, the **CZ Alloy Plan**, through constant periodic inspection and testing, guarantees their fulfillment with the proper alloy.

Any of the leading die casting firms listed here, the only licensed **CZ Alloy Plan** producers, will be glad to explain the plan to you or discuss any die casting problem you may have. A free folder, outlining in full the operation of the **CZ Alloy Plan**, will be sent upon request.

LICENSEES under the CZ ALLOY PLAN

A & A Die Casting Co., West Los Angeles, Calif.
The Accurate Die Casting Co., Cleveland, Ohio
Advance Pressure Castings, Inc., Brooklyn, N. Y.
Advance Tool & Die Casting Company, Milwaukee, Wis.
Badger Die Casting Corp., Milwaukee, Wis.
Central Die Casting & Mfg. Co., Inc., Chicago, Ill.
Cleveland Hardware & Forging Co., Cleveland, Ohio
Congress Drives Division, Tann Corp., Detroit, Mich.
Continental Die Casting Corp.,
Division of F. L. Jdcobs Co., Detroit, Mich.
Crown City Die Casting Co., Pasadena, Calif.
Doehler-Jarvis Division
National Lead Company, Grand Rapids, Mich.
Doehler-Jarvis Division
National Lead Company, Pottstown, Pa.
Doehler-Jarvis Division
National Lead Company, Toledo, Ohio
Dollin Corporation, Irvington, N. J.
Du-Wel Metal Products, Inc., Bangor, Mich.
Federal Die Casting Company, Chicago, Ill.
Globe Imperial Corporation, Rockford, Ill.
C. M. Grey Mfg. Co., East Orange, N. J.
Heick Die Casting Corp., Chicago, Ill.
Hilfinger Corporation, Toledo, Ohio
The Hoover Company, North Canton, Ohio
Kiowa Corporation, Marshalltown, Iowa
Paul Krone Die Casting Co., Chicago, Ill.
Madison-Kipp Corporation, Madison, Wis.
Milwaukee Die Casting Company, Milwaukee, Wis.
Monarch Aluminum Mfg. Co., Cleveland, Ohio
Mt. Vernon Die Casting Corp., Mt. Vernon, N. Y.
Paragon Die Casting Company, Chicago, Ill.
Parker White Metal Co., Erie, Pa.
Precision Castings Company, Inc., Fayetteville, N. Y.
Precision Castings Company, Inc., Cleveland, Ohio
Precision Castings Corp., Chicago, Ill.
Pressure Castings, Inc., Cleveland, Ohio
Racine Die Castings Co., Racine, Wis.
St. Louis Die Casting Corporation, St. Louis, Mo.
Schultz Die Casting Company, Toledo, Ohio
Sterling Die Casting Co., Inc., Brooklyn, N. Y.
Stewart Die Casting Division
of Stewart-Warner Corp., Bridgeport, Conn.
Stewart Die Casting Division
of Stewart-Warner Corp., Chicago, Ill.
Stroh Die Moulded Casting Co., Milwaukee, Wis.
The Superior Die Casting Company, Cleveland, Ohio
The Tool-Die Engineering Co., Cleveland, Ohio
Twin City Die Castings Company, Minneapolis, Minn.
Union Die Casting Co., Ltd., Los Angeles, Calif.
Universal Die Casting Company, Los Angeles, Calif.
Western Die Casting Co., Emeryville, Calif.

AMERICAN DIE CASTING INSTITUTE, INC.

366 MADISON AVENUE NEW YORK 17, N. Y.

Reference Data offered in this month's advertisements

2. DIE LUBRICATION using colloidal graphite dispersions is the subject of a reprint & bulletin from Acheson Colloids.

3. NEW MELTING SYSTEM for die casting shops that requires no labor to move alloy from breakdown to holding furnaces is described in reprinted article offered by Ajax Engineering.

4. ALUMINUM SMELTING industry is the subject of a reprint available from Aluminum Smelters Research Institute.

7. ALUMINUM ALLOY Z-39, developed for die casting is the subject of a report from Apex giving physical properties, specifications, machinability, etc.

8. PLASTER MOLD CASTINGS: what they are, metals that are cast, their advantages, and facilities of Atlantic Casting & Engineering are included in a booklet.

9. ENGINEERING DATA and specs for a line of small die casting machines are listed by A.B.C. Die Casting Machine Co.

10. VACUUM DIE CASTINGS in aluminum bronze are described and illustrated in an informative brochure from Aurora Metal.

11. CERTIFIED ZINC alloy die castings . . . the method set up by the American Die Casting Institute to assure casting buyers of top quality metal . . . is outlined in a booklet.

12. ALLOY SELECTION and Design for Precision Casting are the subjects of a designers' guide booklet offered by Arwood Precision Casting Corp.

13. STEEL PISTON RINGS for die casting machines are described and illustrated in a piece of literature from Auto-Diesel Piston Ring Co. Sizes and prices are listed.

18. TECHNICAL ALLOY service for investment casters and others casting a wide range of metals is the subject of a brochure from Cannon-Muskegon.

19. DIE CASTING MACHINES manufactured by Cast-Master are presented and described in a complete catalog.

20. FIRST ANNOUNCEMENT of a new, fire-resistant hydraulic fluid, Cellulube 150, is accompanied by a descriptive brochure from Celanese Corp. of America.

22. DIE CASTING MACHINES in a wide range of types and sizes are described and illustrated in literature from Cleveland Automatic Machine Co.

26. NON-FLAMMABLE hydraulic fluids, the Ucon Hydrolubes, are described and technical data presented in literature from Carbide & Carbon Chemicals.

28. STANDARD DIE ASSEMBLIES for die casting, including cavity retainer sets and ejector boxes are the subject of specification sheets and price lists from Detroit Mold Engineering.

29. FINE GRINDING for die and mold work with a new type of pencil grinder is the subject of a brochure from Detroit Mold Engineering.

31. SMALL DIE CASTINGS produced by Dollin Corp. are described in one brochure and the company's general facilities for producing standard size die castings are described in another.

To get copies of any item listed here, simply circle the appropriate number on the Reader Service Card bound into this issue.

32. ALLOY SPECS and prices for Certified Alloy Melting Bill-Ettes used in investment casting are listed by Charles Dreifus.

33. HOW YOU CAN USE die castings is the subject of literature offered by Eclipse-Pioneer Foundries who have five types of foundry facilities for casting aluminum and magnesium.

39. SAMPLE CASTINGS and a brochure are offered by Gries Reproducer Corp., specialists in manufacturing tiny die castings.

41. INVESTMENT CASTINGS for economy are presented in a new brochure from Hitchiner Mfg. Co.

42. DIE CASTINGS is the title of an informative booklet available to designers and buyers from the Die Casting Div., Hoover Co.

43. FIRE SAFETY by using Houghto-Safe non-flammable hydraulic fluid is the subject of technical literature from E. F. Houghton & Co.

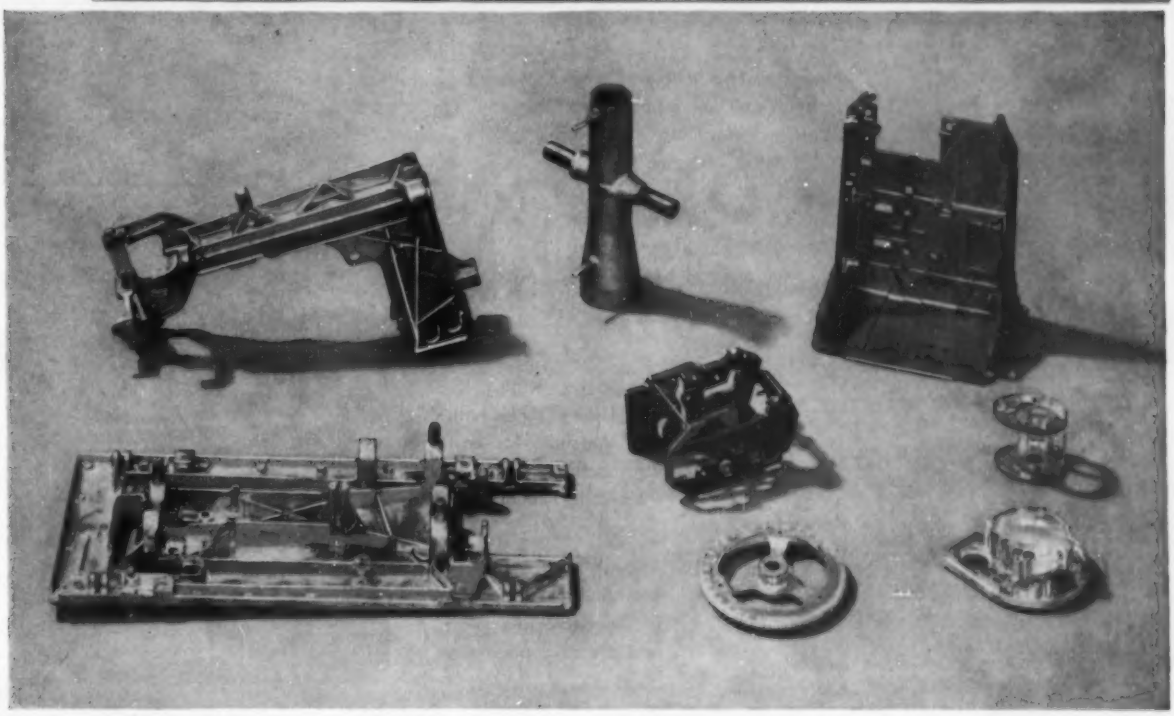
45. SILICONE LUBRICANTS in cans that provide pressure atomizing for improved die casting die lubrication are reported in literature from Injection Molders Supply.

47. MACHINIST'S NIGHTMARE becomes a designer's dream is the graphic title of an impressive folder on investment casting issued by The International Nickel Co.

48. TRIMMING PRESSES developed especially for trimming die castings are the subject of detailed specifications from

Continued on page 20

You can CUT COSTS *with* PRECISION DIE CASTINGS



COMBINE PARTS IN ONE DIE CASTING

Substantial savings in production costs can often be realized by combining several parts into one Precision die casting. Precision's ability to produce die castings using intricate dies and coring methods offers you almost unlimited possibilities in savings.

You benefit two ways — the cost of producing one die casting is usually less than the sum of several of its parts in smaller castings. Secondly, you eliminate the assembly costs involved in putting together the smaller parts.

We'd be glad to discuss your problems with you and show you how you can cut costs.

Write for complete information TODAY!

PRECISION CASTINGS CO., Inc.
212 Walnut St., Fayetteville, N. Y.
Syracuse, N. Y. · Cleveland, O. · Chicago, Ill.
Kalamazoo, Mich. · Cortland, N. Y.
British Affiliation — Wolverhampton Die Casting Co., Wolverhampton, England

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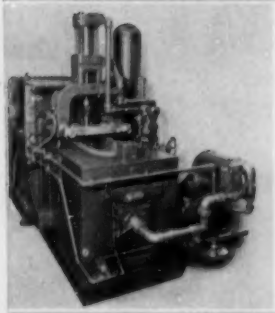
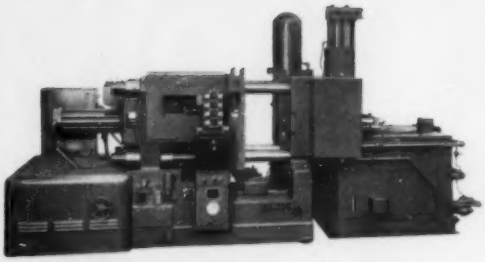
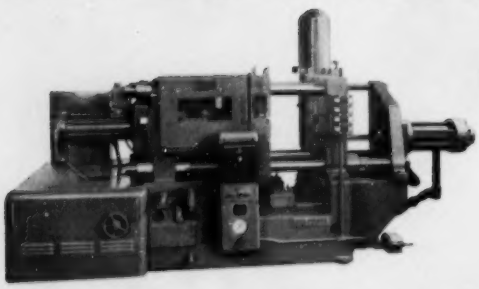
Exclusive REED-assure high-speed,



New gooseneck arrangement features quick change plunger coupling. Melting furnace holds 1000 lbs. zinc

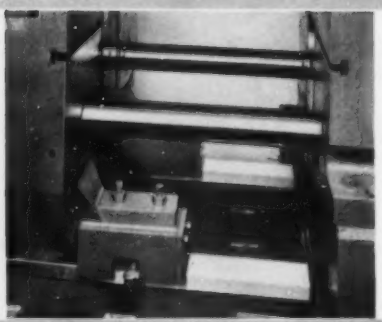
No. 1½ Reed-Prentice Die Casting Machine for casting zinc, tin or lead base alloys

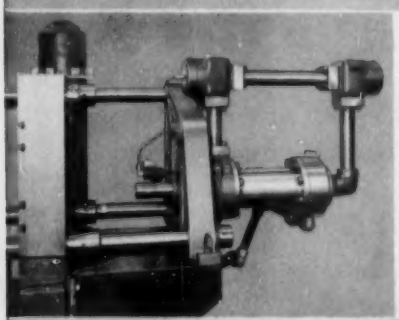




No. 1½G "Cold Chamber" Machine for casting aluminum, magnesium or brass alloys

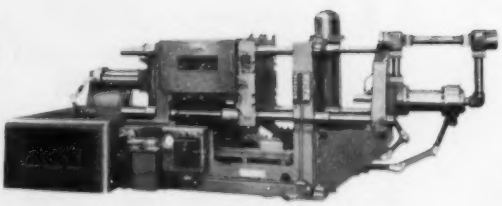
Sliding steel brackets furnish added support for movable die plate and preserve alignment





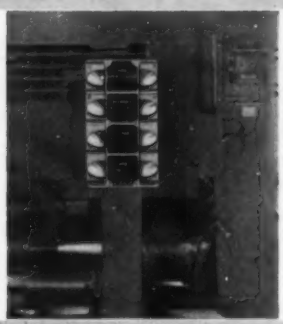
Optional "Hi-Speed Hi-Pressure" Plunger attachment for No. 1½G and 2G models boosts plunger speed to 10,000 in. per minute

Reed-Prentice No. 2G Die Caster equipped with "Hi-Speed Hi-Pressure" Plunger attachment



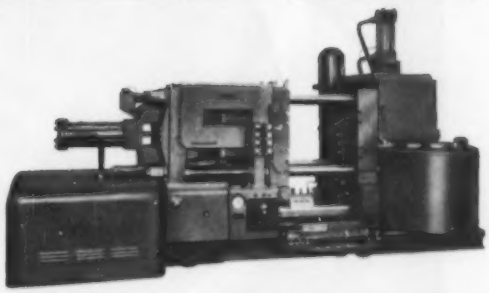
BUILT into Reed-Prentice Die Casting machines are exclusive design features that assure steady, profitable production of uniform, dense die castings. Positive mechanical die locking tonnage, permanent machine alignment, easy and safe operation through central controls add up to years of trouble-free, efficient die casting.

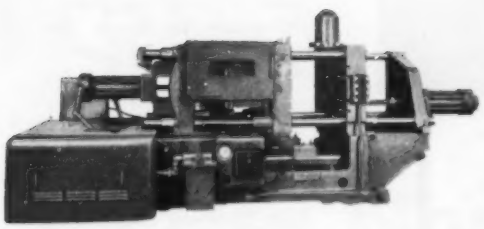
PRENTICE *Features*
precision die casting



Convenient operating station controls die opening and closing, plunger movement and actuation of core pulling cylinders

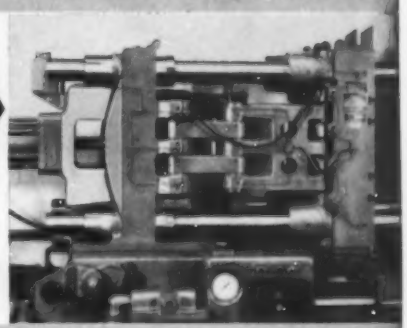
No. 2 High Pressure Plunger Gooseneck model casts zinc parts weighing up to 17½ lbs.





Positive mechanical die locking eliminates all "pressure back-off" to produce porosity-free, "hardware finish" die castings

No. 2G "Cold Chamber" machine casts up to 9 lbs. of aluminum and up to 6 lbs. of magnesium



Principal specifications are listed here. If you would like complete information on all models, write for Catalog #954.

SPECIFICATIONS	Model #1½	Model #1½G	Model #2	Model #2G
Size of die plates (height x width)	32 x 29"	32 x 29"	38 x 36"	38 x 36"
Diameter of tie bars	4"	4"	4"	4"
Space between bars (height x width)	20 x 15"	20 x 15"	24 x 24"	24 x 24"
Die Opening	10¼"	10¼"	14"	14"
Maximum die space	22"	22"	30"	30"
Capacity per shot (lbs.)	15-zinc	3.75-alum.	17½-zinc	9-alum.
Die locking tonnage	275	275	400	400
Machine weight, lbs.	16,500	14,500	24,750	22,700

REED-PRENTICE CORP.

MAIN OFFICE • 677 CAMBRIDGE ST., WORCESTER 4, MASS.

AMERICAN REPRESENTATIVES

Houston . Steel & Machine Tool Sales Co.
Seattle & Spokane . . Star Machinery Co.
Minneapolis . . . . . Chas. W. Stone Co.
Los Angeles . Western Molders Supply Co.

CANADIAN REPRESENTATIVE

DAWSON-RHOADES-THIBODEAU MACHINERY CO.
149 Main St., E. Hamilton, Ontario Canada
1105 Dominion Square Bldg. 1010 St. Catherine St., West Montreal, P. Q., Canada

BRANCH OFFICES

75 West St., New York 6, N. Y.
1213 West 3rd St., Cleveland 13, Ohio
4001 N. Elston Ave., Chicago 18, Illinois
2842 W. Grand Blvd., Detroit 2, Michigan

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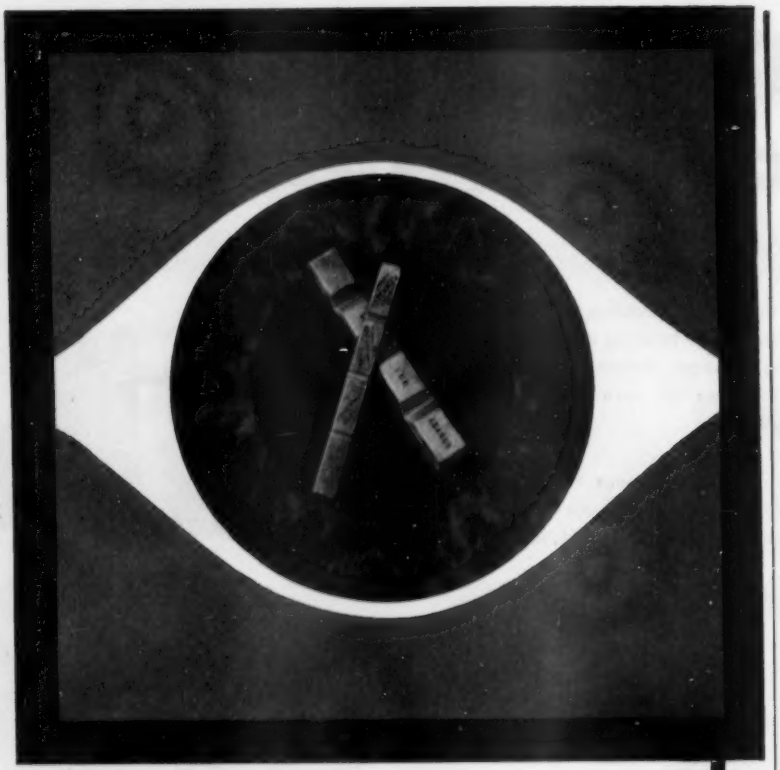


Let's look at the facts about die casting metals

Most people claim aluminum and zinc die cast alloys are pretty much the same wherever you buy them. Maybe. But that's not the point.

You want more than the *product* when you buy metal. You want *service* from your supplier.

Federated service gives you:

1. Research, constantly working to give you a new and better metal.
2. Practical Help, in your shop, by field experts whenever you have a metal problem.
3. Fast Deliveries; 14 plants across the country.
4. Metal Variety; any die casting alloy you need, aluminum, zinc or magnesium.

Try Federated metal-plus-service. It's the best metal plus the extra of competent technical help with your problems.

Federated Metals Division

AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Aluminum, Magnesium, Babbitts, Brass, Bronze, Anodes, Zinc Dust, Die Casting Metals, Lead and Lead Products, Solders, Type Metals

Circle No. 36 on Reader Service Card

REFERENCE DATA
continued from page 16

Johnson Machine & Press Corp. who have just introduced three new presses for this purpose.

50. DIE CASTING MACHINES built by Kux Machine Co. are presented in detailed specifications in the company's complete catalog.

51. LARGEST MACHINE commercially available for die casting is subject of descriptive matter from Kelvin Systems who represent the Italian firm manufacturing with a unit with 1300 tons locking pressure.

52. COLD CHAMBER die casting machines manufactured by Lewis Welding are given comprehensive description and illustration in the company's catalog.

53. TWO-CHAMBER MELTING with Lindberg-Fisher induction melting furnaces is described and illustrated in bulletin 560 from Lindberg Engineering.

54. DESIGNING ALUMINUM and magnesium die castings is the subject of an informative brochure offered by Litemetal Dicast.

56. DIE CASTING MACHINES in a full range of capacities and types are included in Lester-Phoenix' complete catalog.

59. HOW TO MOVE hot die castings and other heated materials on a production line is the subject of a bulletin on hinged-steel conveyors available from May-Fran Engineering.

60. CHROME-NICKEL pre-alloyed powders for powdered metal parts having high physical properties are the subject of technical engineering reports issued by Metal Hydrides.

62. FACT-FILE on cutting costs with aluminum and zinc die castings is offered by Monarch Aluminum Mfg. Co.

Continued on page 108

STOP HYDRAULIC OIL FIRES

Use Non-flammable HOUGHTO-SAFE

get this 4-way safety!

- Snuffer-type—non-flammable
- High Lubricity assures safety against wear
- Non-toxic
- Won't attack packings

Houghto-Safe . . . rated "Acceptable From The Fire Hazard Standpoint" by Factory Mutual Laboratories . . . is safe all around. Ask the Houghton Man for proof of its benefits that far outweigh its low cost. Or get it from E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

HOUGHTO-SAFE

. . . a product of

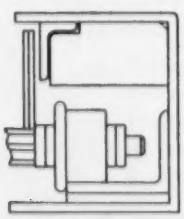
E. F. HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

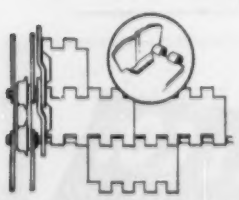
Ready to give you on-the-job service . . .

Circle No. 43 on Reader Service Card

May-Fran hinged-steel conveyor belts



Construction details of "skirt" which prevents entry of foreign matter and protects side chains.

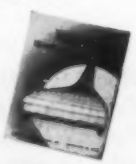


Outside links incorporate interlocking wings . . . remain positively engaged at all times.

For more efficient, more economical production in your plant . . . mechanize the handling of die castings. MAY-FRAN Hinged-Steel Belting keeps castings on the move . . . continually . . . automatically. Saves handling equipment, saves aisle space, saves manpower.

MAY-FRAN Hinged Steel Conveyor Belting withstands hot, heavy or abrasive parts . . . is built for long life and maintenance-free operation. Precision formed, heavy-gauge hinged-steel links are connected in horizontal rows by means of high-carbon steel rods. Side chains are an integral part of the belt . . . interlocking wings remain positively engaged, even when traveling over sprockets.

MAY-FRAN Hinged-Steel Belting can be furnished in widths from 6 inches to 6 feet . . . in any length . . . in any carrying capacity . . . with solid or perforated links in 2½ to 12-inch lengths.



For complete information, write today for Bulletin MF-530.

DESIGNERS AND BUILDERS OF COMPLETE HANDLING SYSTEMS

MAY-FRAN

ENGINEERING, INCORPORATED

1686 Clarkstone Road • Cleveland 12, Ohio

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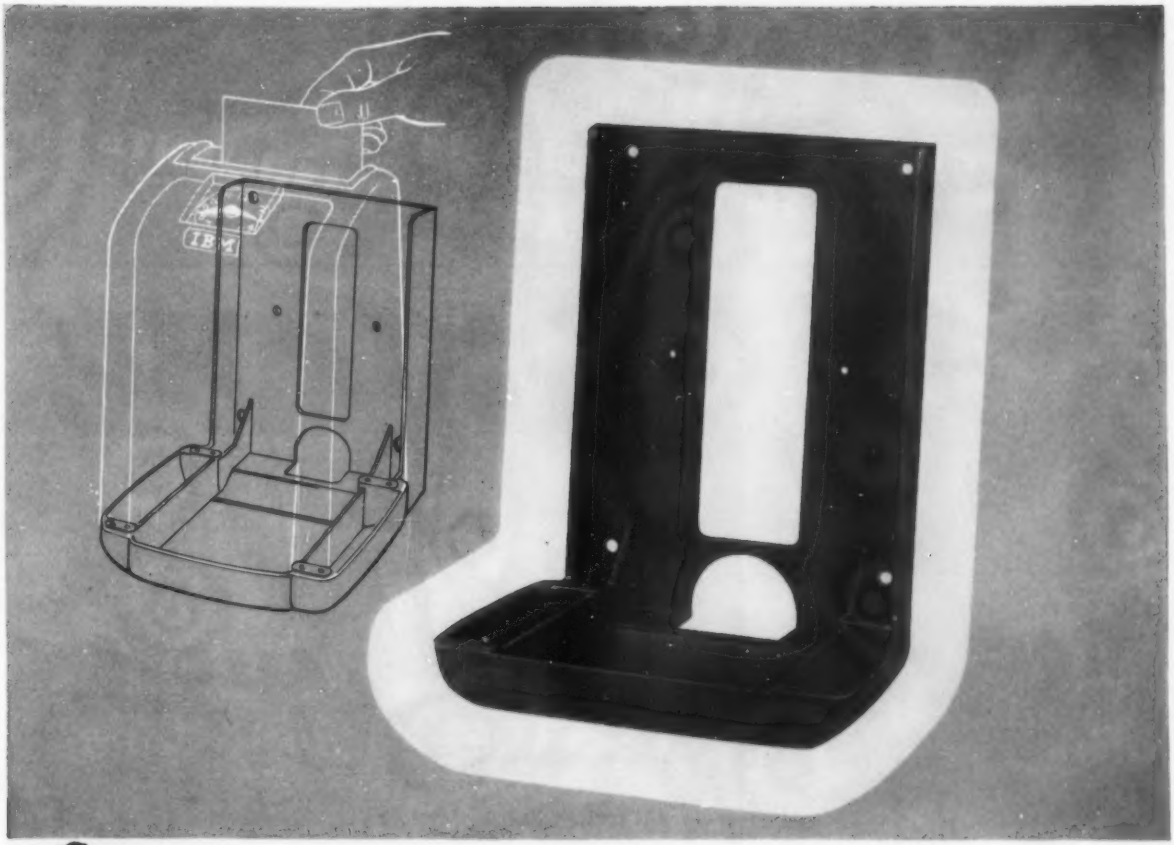

TIME MARCHES ON *automatically . . . supported by* PARKER DIE CASTINGS

PARKER SALES ENGINEERS

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Ollie J. Berger Company • 2059 East 72 Street

CINCINNATI, Ohio
William H. Broxterman • 2174 Buck Street

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Hodgson-Geisler Co. • 18917 James Couzens

GIRARD, Penna.
Daniel F. Marsh • 35 Chestnut Street

WILTON, Conn.
Girard L. Palmer • Belden Hill Road

SYRACUSE, N. Y.
J. C. Palmer • 712 State Tower Bldg.

BELLEFONTE, Penna.
Warren G. Olsen • 420 East Linn Street

IBM'S fully-automatic, electric time recorder is a far cry from the old-fashioned time clock. This modern engineering development handles with ease and sureness any kind of work schedule, no matter how complex. To produce the wall mounting bracket shown above, IBM and Parker together worked out the design of the part. The result: a die casting that meets every specification at lower total cost.

This close co-operation from blue print to finished product typifies the complete engineering—as well as manufacturing—service offered by Parker. No matter how complex your die casting problem, Parker will be glad to help you find the answer. Just call the nearest Parker sales engineer listed at the left or write the factory direct.

Parker White Metal Company • 2153 McKinley Ave., Erie, Pa.

PARKER **ALUMINUM and ZINC *die castings***

Circle No. 68 on Reader Service Card

WE SALUTE ADCI
FOR ITS CONSPICUOUS
ACCOMPLISHMENTS!

HENNING
Zamak
ALLOYS
ARE THE *Stepping Stone* TO BETTER DIE CASTING!

For a well balanced production schedule you need alloys which are the last word in Uniformity, Precision and Quality.

HENNING ZAMAK (Zinc Base) DIE CASTING ALLOYS have been the choice of discriminating buyers for more than 30 years. Our product comes to you strapped on consumable runners of the same alloy to save time and facilitate handling.

We have recently added a Spectrograph to our present laboratory facilities, thus enabling us to check our metal throughout its melting cycle. We can, therefore, guarantee exact ingot metal quality. We have our own private railroad siding which speeds shipments. Ask about our Aluminum Die Cast Alloys.

HENNING BROS. & SMITH, INC.
91-113 Scott Avenue • Brooklyn 37, N. Y.
DEPENDABLE SERVICE SINCE 1922

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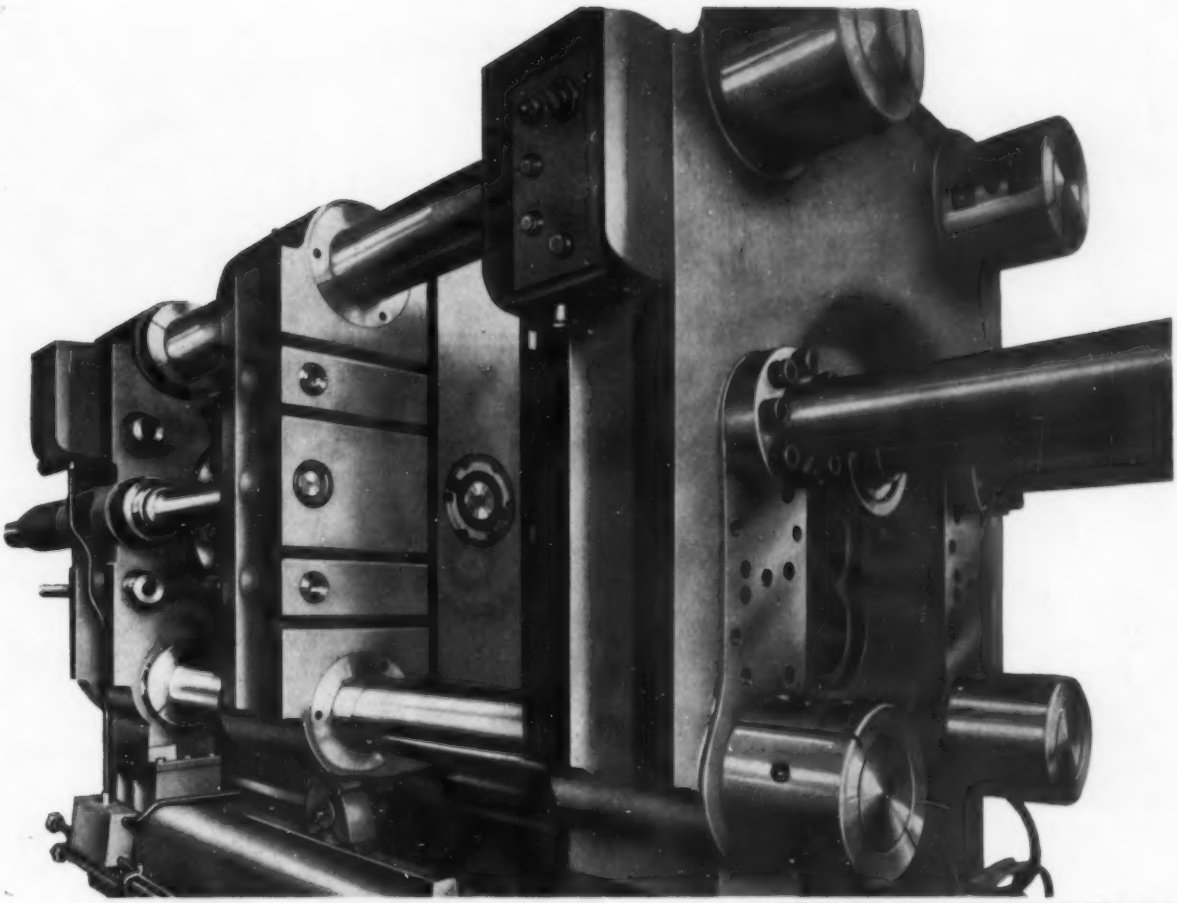

The Largest and Most Powerful Die Casting Machine with 1300 Ton Locking Force

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Die Casting Machines — Injection Moulding Machines for Thermoplastics — Compression Moulding Hydraulic Presses for Thermosetting Materials — Hydraulic Transfer Presses for the Injection Moulding of Thermosetting Materials — Hydraulic Presses for Different Purposes — High Pressure Hydraulic Pumps — Hydropneumatic Accumulators — Hydropneumatic Plants.

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FACTS on NON-FLAMMABILITY *and* UCON Trade-Mark hydrolubes

WHAT... are UCON hydrolubes?

UCON hydrolubes are safety hydraulic fluids. They are balanced formulations of water, a synthetic lubricant, an anti-freeze, and selected inhibitors. The water content is the key to their non-flammability.

WHO... should use UCON hydrolubes?

Any one who has hydraulic lines or equipment around potential sources of ignition.

WHERE... can UCON hydrolubes be used?

In die-casting machines, combustion control regulators, hydraulic welding machines, ingot manipulators, and other equipment.

WHY... should I choose UCON hydrolubes?

Because the resistance of UCON hydrolubes to burning has been proved by years of severe, exhaustive testing in the laboratory. AND, in *actual service*, UCON hydrolubes have prevented fires and serious damage during their more than 6 years of routine use.

and UCON hydrolubes...

* Have no harmful effects on packings and seals. Leakage losses are often lower than with regular hydraulic fluids.
* Contain effective liquid- and vapor-phase corrosion inhibitors for the common metals.
* Have good lubricity. Special anti-wear agents provide satisfactory pump life and performance characteristics.
* Are made in 3 viscosity grades—200, 300, and 550 S.U.S. at 100° F. Other viscosity grades can be supplied to fit specific requirements.
* Have high viscosity indexes—150 to 160.
* Have low pour points—below minus 55° F. UCON hydrolubes flow readily at low temperatures.
* Are non-toxic for all practical hydraulic purposes.
* Are water-soluble. Spillage is easily washed away.

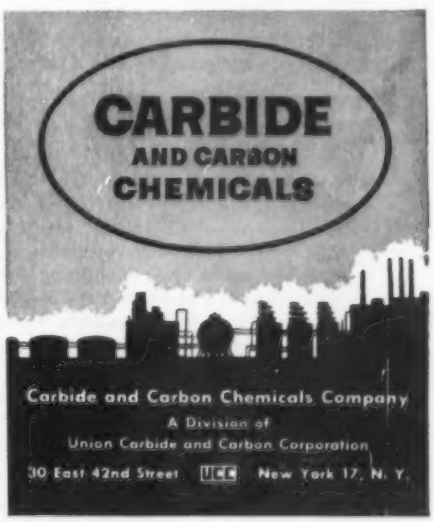
HOW... do I change over to UCON hydrolubes?

By draining the old fluid from your system, following the cleaning procedure that CARBIDE recommends, and refilling. You don't have to revamp your equipment.

WHEN...

Today—write for detailed information. Ask for the booklet, "UCON Hydrolubes" (Form 7380). In Canada: Carbide Chemicals Sales Company, Division of Union Carbide Canada Limited, Toronto.

"Ucon" is a registered trade-mark of Union Carbide and Carbon Corporation.



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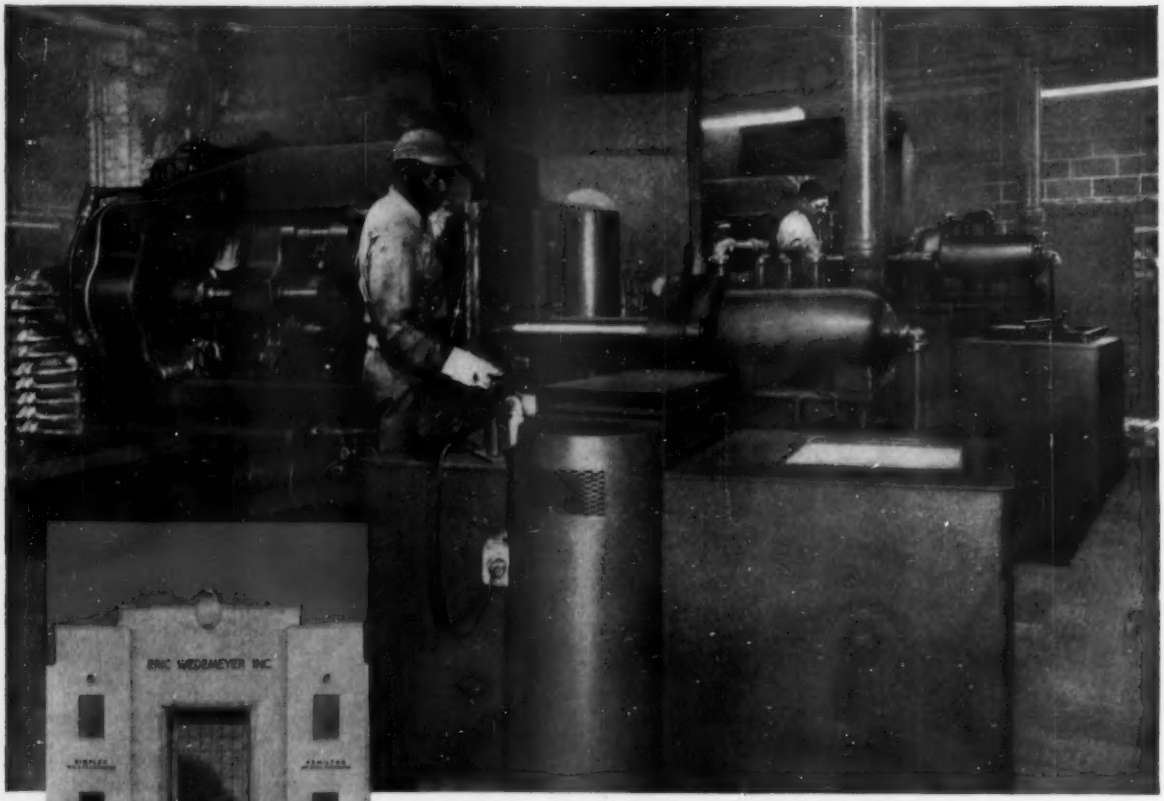

HAMILTON ART METAL CORP. plans to use *LINDBERG-FISHER* melting furnaces exclusively

The Hamilton Art Metal Corporation, New Hyde Park, New York, has equipped five die casting machines with Lindberg-Fisher, 40 KW, two chamber induction melting and holding furnaces for aluminum. Each furnace was purchased, one by one, based on the excellent performance of previous units. Noted for the quality of its intricate castings, this job die casting plant has increased production 38% and cut rejects to the bone by using the Lindberg-Fisher principle of induction melting.

The term "satisfaction" would be a gross understatement as reflected in the words of Mr. Eric Wedemeyer, President, who says:

"I am making plans for the day when our plant will be 100% Lindberg-Fisher equipped. If it were not for local power limitations, we would immediately replace the fuel fired equipment we are forced to partially use in favor of additional induction equipment designed by Lindberg-Fisher. Improved operator working conditions have brought our personnel turnover to a stand-still.

In my opinion Lindberg-Fisher furnaces are head and shoulders above other methods of melting found in the field of die casting today."

You'll increase production. You'll reduce rejects. You'll improve working conditions. The famous Lindberg-Fisher 2-chamber construction does the trick.

Two-chamber construction gives you cleaner molten metal and permits continuous ladling. Cold metal can be added to the charging chamber without affecting temperature of ladling chamber. Scrap can be re-charged thereby eliminating handling and identification problems.

Two-chamber construction permits cooler working conditions. Induction heating heats only the metal, not the entire furnace. There are no flames—no products of combustion. Only a comparatively small area of molten metal is exposed to the operator.

Ask for a copy of bulletin 560 "Lindberg-Fisher two-chamber melting furnaces."

LINDBERG-FISHER MELTING FURNACES

Lindberg Engineering Company • 2495 West Hubbard Street • Chicago 21, Illinois

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BOOKS

QUALITY CONTROL—Second Edition. By Norbert L. Enrick. 181 pages, 6 by 9 inches. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price $4.

In this enlarged second edition, some 60 pages of new text, tables, and charts have been added to provide a more complete and useful discussion of quality control in its various aspects.

Among the new subjects considered are the co-efficient of variation, a yardstick of variability which is often useful, especially in the processing industries; how to test a distribution for normality; how and when to use control charts computed from center lines; the application of multiple control charts to control several individual components of a product at one time; the use of acceptance control charts for accepting or rejecting a product received from an outside supplier; the interpretation of frequency distribution curves; where to use control charts for per cent defective product; and the analysis of variations between machines and departments as an aid in locating sources of product difficulty.

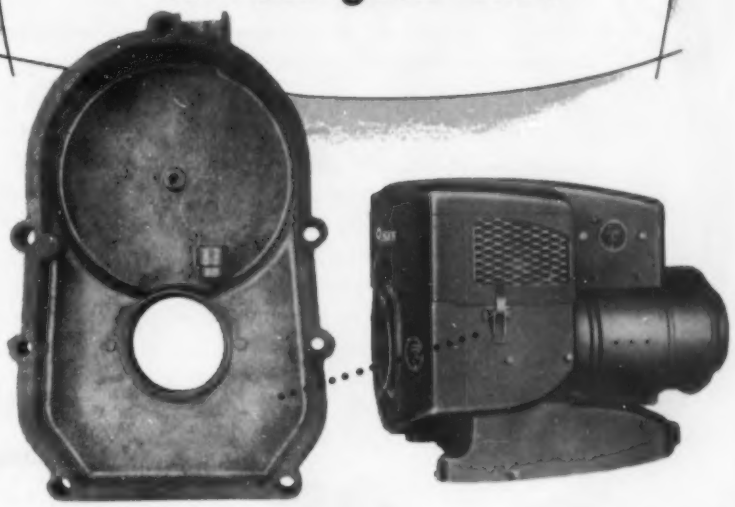
As in the first edition, a simple direct approach to each subject is used and both highly technical language and complicated mathematical formulas are avoided. The emphasis is placed on the practical application of quality control and an understanding of the basic methods.

All the essential techniques of modern quality control are covered, such as sampling plans, control charts, analysis of variations, statistical determination of tolerances, as well as administrative procedures and controls.

here's how

TWIN CITY DIE

helped Onan cut 19 machining operations off this gear case



Using sand casting methods, 31 expensive machining operations were necessary in manufacturing this Onan gear case. Machining operations were complex, time and handling costs were high. Costs had to come down.

Twin City cut the required machining operations to 12 by die casting the gear case and governor shaft boss in one operation. A loose core was inserted into the die before each "shot" to cast the double-diameter governor boss. Holding relative tolerances as close as .003 "over 6" eliminated many machining operations, simplified others. Result: far lower unit cost, far simpler machining—precision accuracy with production economy!

This Onan gear case is just one example of how Twin engineers and die casters work with you to cut your costs. Oldest die caster in the Upper Midwest, Twin City *keeps* its leadership because of its willingness and ability to look at every job through the customer's eyes.

Get the facts for yourself! Send us samples or blueprints and let us demonstrate Twin City service to you!

MACHINING OPERATIONS ON GEAR CASE

WITH SAND CASTING	WITH DIE CASTING	
17	0	Drilling
2	1*	Machining face
3	3	Ream rotor shaft holes (Tolerances: +.0003"—.0000; +.0005"—.0000"; +.001"—.000")
5	5	Tapping
2	1	Machining operations on main shaft bearing hole (Tolerance: +.000"—.001" I.D.; and +.001"—.000" O.D.)
2	2	Reaming dowel pin holes
31	12	

19 OPERATIONS ELIMINATED!

*Light sanding only.

TWIN CITY DIE CASTINGS CO.

3351 TALMAGE AVE. S.E. • MINNEAPOLIS 14, MINN.

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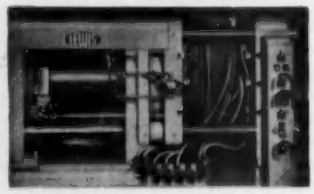
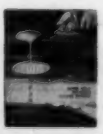
Listen to the newest heartbeat of the die-casting industry

The LEWIS 650-B die-forge casting machine is setting new standards for the industry! It has no equal for the economical mass-production of high-strength aluminum and magnesium alloy parts.

Key to the superiority of the LEWIS 650-B is the powerful two-stage injection system used in conjunction with the exclusive "HYDRA-LOCK" clamping mechanism. Hydraulic injection plunger fills dies rapidly, and then molten metal is forged with final squeeze pressures up to 100,000 pounds. These tremendous pressures are possible because of the "HYDRA-LOCK" mechanism, which exerts a 650-ton hydraulic clamping pressure to keep dies closed and prevent "spitting." It also permits quicker die setting and compensates for moderate misalignment of die faces.



"HYDRA-LOCK" clamp in closed position. A sliding block automatically moves into position behind strut to assure full locking pressures for clamping mechanism.



WRITE FOR BULLETIN 103 FOR DETAILS AND SPECIFICATIONS

To stay competitive in today's market, specify the LEWIS 650-B die-forge casting machine.

4033-LW

LEWIS

THE LEWIS WELDING AND ENGINEERING CORPORATION

63 INTERSTATE STREET — BEDFORD, OHIO

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Do you use parts like any of these*?

***All made as DOLLIN Zinc and Aluminum Die-Castings**

Most of these parts were purchased by leading manufacturers . . . experts at getting the "best buy". Do you see one that resembles a part you use now, or need? If you do, why not check with us for possible savings? Send prints or samples for estimates and engineering advice, at no obligation. Or, write for our General Facilities and/or Small Parts Bulletins.

DOLLIN CORPORATION, 614 South 21st Street, Irvington, N. J.

DOLLIN Zinc and Aluminum DIE-CASTINGS

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Keeping you in business is the aluminum smelters job

...FACTS YOU NEED ALUMINUM INGOT

Aluminum Smelters' products are designed for FOUNDRIES

The alloys produced for you are the major items of aluminum smelters—80% of their business is *your business*. Therefore, casting alloys are the *main endeavor*—not a sideline to be pursued "when, as, and if."

no foundry ever shut down because

TO KNOW ABOUT FROM SMELTERS

Smelters have no tie-in or integration with any wrought product mills

That's why smelters have always been, and continue to be, *the one reliable* source of supply for FOUNDRIES. Regardless of the demand for other products, the aluminum smelters' efforts are centered on casting alloys *for you.*

The record proves the facts

The histories of the Aluminum Casting Industry and the Aluminum Smelting Industry prove their interdependence. The growth of each has paralleled and depended upon the growth of the other.

The Foundry and Die Casting Industries' best insurance is a strong and vigorous Aluminum Smelting Industry

The best insurance for continued growth of the Aluminum Casting Industry lies in the opportunity for unlimited choice from the many independent producing units constituting the Aluminum Smelting Industry, which offers fast and specialized service and provides quality alloys for *FOUNDRYMEN FIRST.*

ingot was not available from smelters!

Aluminum Smelters Research Institute
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Service
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Dependability
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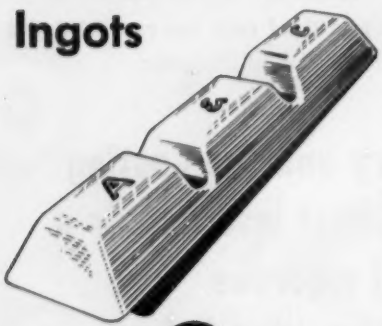
Aluminum Alloy Ingots



Alloys & Chemicals

MFG. CO., INC.

CLEVELAND 9, OHIO

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Between the Lines of this and future issues

Die Casting . . . Potential Unlimited!

We have a lot of faith in the future of the die casting industry; we know that today's uses for die casting, as widespread and as significant as they are, represent only a beginning. One by one, the die casting industry has been crossing new frontiers that increase the usefulness of their product . . . better alloys, higher physical properties, larger sizes, lower costs, improved surfaces, new finishing methods . . . and there are definite signs that new technological improvements are in the offing. For this reason, the editors of PMM offer this Forecast Report, beginning on page 51, suggesting some of the future trends in die casting.

A Special Problem in Permanent Mold Casting . . .

One highly specialized type of casting, with unique performance requirements, is the lead grid used in batteries. A detailed technical report on how one company has improved both the design and production methods of battery grids begins on page 68.

Are Silicone Enamels Practical on Die Castings . . .?

Complete information on how to apply silicone paint to die castings, how to prepare the surfaces, how to bake, and also, how to avoid common defects that may occur . . . is offered by PMM's specialist in finishing techniques, Lynn Sprague, beginning on page 83. If you have wondered whether these paints are practical, you'll want to read the comments of this expert who has had experience in using silicone enamels on die cast zinc.

Metal Structures & Metal Properties . . .

The large audience at the Investment Casting Institute's spring meeting was so impressed by a report by Dr. Nick Grant of M.I.T. on metal structures and metal properties of investment castings, specifically as related to jet blading, that we asked permission to adapt his paper for presentation to a wider audience of engineers in PMM's readership who weren't able to get to the ICI sessions. The paper begins in this issue on page 122.

Powder Metallurgy for Designers . . .

Third in our series of basic factual reports on the PMM processes for product designers will be the report on Powder Metallurgy which will be a feature of the October issue.

Grade A Designing with MADISON-KIPP Zinc and Aluminum Die Castings

A mass production item like the automotive thermostat body here illustrated, requires Grade A designing by the principal and the die caster. It may often be found that a close tolerance can be maintained more economically on one component rather than another. Or a master control point may belong here not there.

This sort of give and take is intelligent pre-planning always encouraged by Madison-Kipp mechanics who have helped promote a vast number of successful projects.

When you have die casting requirements please write to our home office Madison.

kipp

MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WIS., U. S. A.

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

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YOUR
"ALL-IN-ONE" SOURCE
for PERMANENT MOLD
CASTINGS in ALUMINUM

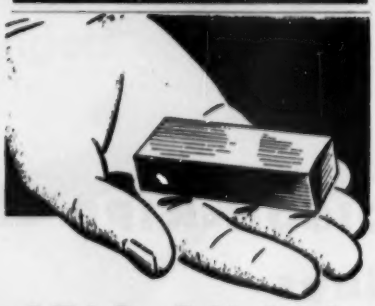
We offer complete service on aluminum permanent mold castings. We also have complete foundry facilities for sand casting aluminum, brass and bronze.

Heat Treating Facilities for Aluminum Alloys

Design assistance or consulting engineering service on your casting problems.

Write for information, or send your prints for quotations

Mansfield Brass & Aluminum Corporation
MANSFIELD • OHIO



IT'S SMALL
BUT IT CAN SAVE YOU MONEY!

It's a Certified Alloy Melting BILL-ETTE for precision casting. Save costly, time-consuming cutting-up of larger units — choose from over 30 different alloys produced to exact specifications. Certificate of Analysis and Heat Number with each shipment. Packed in 100 lb. kegs.

For specifications and prices on Certified Alloy Melting BILL-ETTES and any metallurgical assistance you may need, write METALLURGICAL Division.

CHARLES DREIFUS COMPANY
LINCOLN-LIBERTY BLDG., PHILADELPHIA 7, PA.
Serving the Steel Industry for Over 65 Years

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THEY GET DURABILITY— WITH A ZINC DIE CASTING

WHAT factors go to make up a good, adjustable spray hose nozzle?

Among others are clean, compact design; a minimum of parts that can wear out or need servicing; easy, but positive operation; attractive appearance; ability to withstand normal abuse; and finally, low cost.

The Automatic Lever Spray Nozzles made by Kay Products Industries fulfill all of these requirements, primarily because the main structure was designed to be made as a zinc die casting.

Two nozzles, one industrial and the other for home use, are shown in the illustration, along with the basic casting that is used for both models.

As cast the body is almost ready for use. Because two internal threads are required, they must be cut after casting and, to simplify die construction, the pivot hole for the handle is drilled rather than cored.

A brass valve stem is used in these units and the as-cast seat is adequate to give a good water seal under pressure.

Since water saving in industrial applications is important, no provision is made on the industrial model to lock the nozzle in an open position as is done on the home model.

Surface finish on the industrial model is chromate or phosphate coating for corrosion resistance, but no other finish. On the home model, a light chromium plate is applied to give eye-appeal.

Finally, since such nozzles, when used in industrial applications, are likely to be dropped or thrown on hard floors, a rubber bumper is sealed onto the end to absorb these shocks. This bumper is cemented to the die casting with Vulcalock adhesive made by the B. F. Goodrich Co.

PRESSURE CASTINGS subscribes wholeheartedly to the Certified Zinc Alloy Plan. We consider it good business to do so.

The Certified Zinc Alloy Plan requires the periodic submission of die castings to an approved and unbiased testing laboratory for the purpose of determining if their chemical composition meets strict ASTM specifications.

In addition, field representatives periodically visit member plants to select additional samples in production for test purposes.

Each sample casting must test "on grade" for the producer to retain his license and the right to use the Quality Certification Seal.

Every one using zinc die castings in their production should insist on CERTIFIED ZINC die castings.

PRESSURE CASTINGS, INC.

die castings

CLEVELAND 19, OHIO

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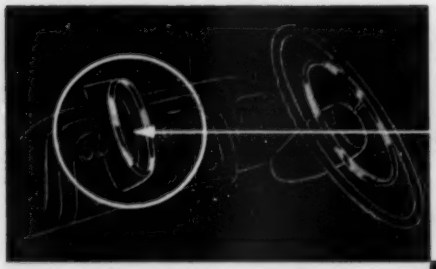
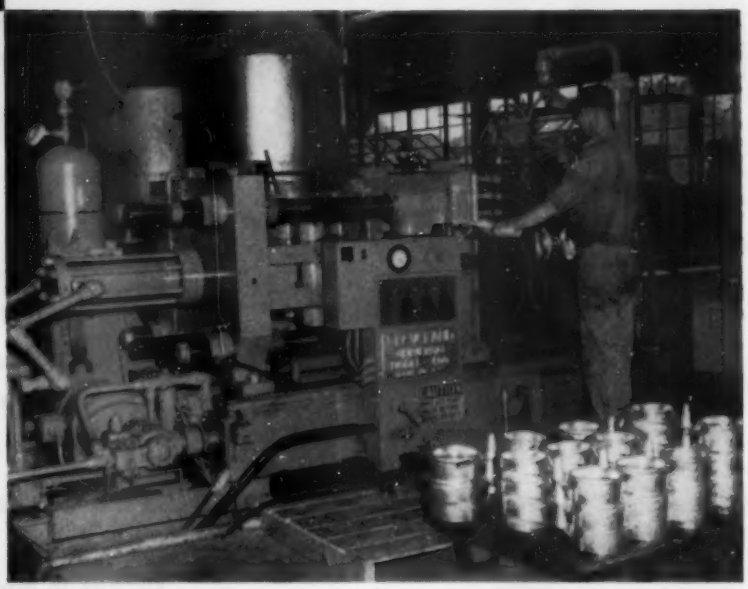


426 MPH*

in a CLEVELAND die casting machine!



* That's the actual figure, but the abbreviation stands for units *made* per hour — in the Cleveland Die Casting Machine shown at right. Working in the ultra-efficient King-Seeley plant at Scio, Michigan, this Cleveland machine is speeding production of automobile dashboard instrument parts. The part being produced, an instrument cluster housing, is shown below, "as cast."

King-Seeley uses zinc die castings extensively for such parts as the horn ring shown below; housings for telegages (water temperature, fuel level and oil pressure); bezels; small intricate frames; and speedometer and gauge components. Chances are your car has several King-Seeley products in it.

NOTE:
King-Seeley likes this Cleveland so well they just purchased a second machine.

King-Seeley Corporation, leading supplier of dashboard instruments to major automobile manufacturers, is widely known for excellence of product design and construction; for high efficiency in manufacturing methods. To maintain critical standards in its die casting department, King-Seeley relies on a Model 400 Cleveland to produce top quality castings at high speeds.

Typical of the parts produced on this Cleveland machine is the instrument cluster housing shown above. Approximately six pounds of zinc alloy are injected into the die, producing two parts per shot. The Cleveland's powerful die locking pressure and high injection speed produce sound, dense, *"hardware finish"* castings. Dimensions are held to close tolerances. Secondary drilling operations on the part have been eliminated by precision coring of 13 holes. Production averages 213 shots—426 parts —made per hour.

To get the *most* from *your* die casting department—in speed of production and quality of casting—profit from the experience of leading die casters and investigate the advantages of the Model 400 Cleveland. Your inquiries will receive prompt attention. For machine specifications, write for free copy of bulletin.

4952 Beech Street
Cincinnati 12, Ohio

THE CLEVELAND AUTOMATIC MACHINE COMPANY

SALES: OFFICES: CHICAGO
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Manufacturers of a Complete Line of Spindle Automatic-Screw Machines and High Pressure Hydraulic Die Casting Machines

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no miracle claims for Die Slick or Plunger-Slick

We do not claim that Die Slick or Plunger-Slick will remove all causes of stuck castings, because obviously a die casting compound has no power to correct cases of inherently bad die design. But they do help!

It's true that in many borderline cases where die or operating defects are not too serious, the die lubricant frequently acts as the corrective agent, enabling satisfactory production. There are many instances in our files where Die Slick or Plunger-Slick proved their worth by turning out satisfactory castings where other compounds failed.

One of the greatest user benefits reported to us is the inherent preventive maintenance charactcristics of Die Slick and Plunger-Slick. When a die lubricant fails, castings stick or expensive dies are either destroyed or unduly worn, with the result that production is interrupted and downtime costs pile up.

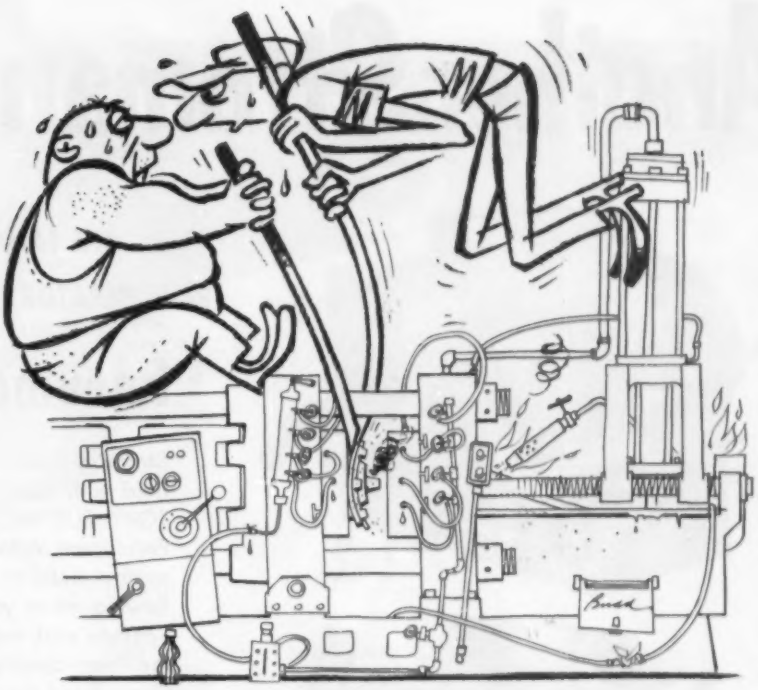
Every shop is interested in beating these problems, and that is where we know Die Slick and Plunger-Slick work "sleeves up" all the time. What it really boils down to is this - - - If you want to run the most profitable die casting operation, then Die Slick and Plunger-Slick compounds are essential.

And remember, more than 80% of all die casters do use Die Slick and Plunger-Slick compounds. A week's supply of any of our compounds for production testing, will be sent on request.

Cordially,

V. W. Smith

V. W. Smith



After we bust this one out, Abercrombie, I insist you try Die Slick

. . . and when Abercrombie does, he'll lose that haggard look, and have no further use for crowbars either. Stuck castings cost money, yet it's so easy to prevent them by regular use of Die Slick or Plunger-Slick.

Four out of five die casters do use our compounds because they have proved it helps maintain production, cut down-time, and save rejects even on the toughest jobs.

Unlike "home-made" concoctions, standardized Die Slick and Plunger-Slick compounds reduce smoke nuisance, sticking, scoring, soldering, ejector pin breakage, rejects resulting from poor surface finish—and all the other casting problems involved in getting castings out in apple-pie order. Send for a week's supply for your toughest job (specify whether for zinc, aluminum, magnesium or brass) and if you are not completely satisfied, we'll cancel the invoice!

DIE SLICK®

used by die casters everywhere

G. W. SMITH & SONS, INC. 5403 Kemp Road, Dayton 3, Ohio

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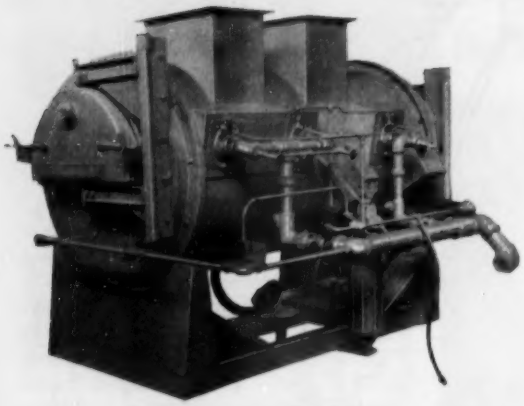
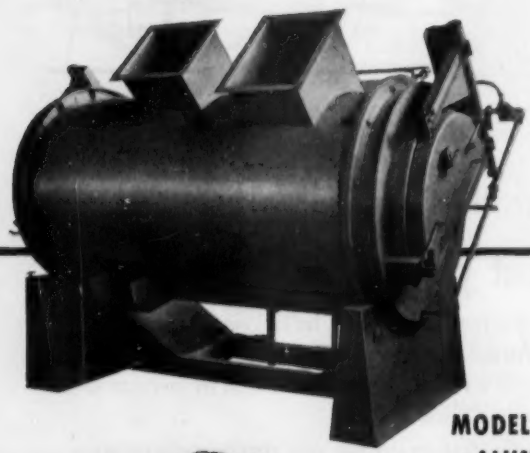
Another Stroman 1st

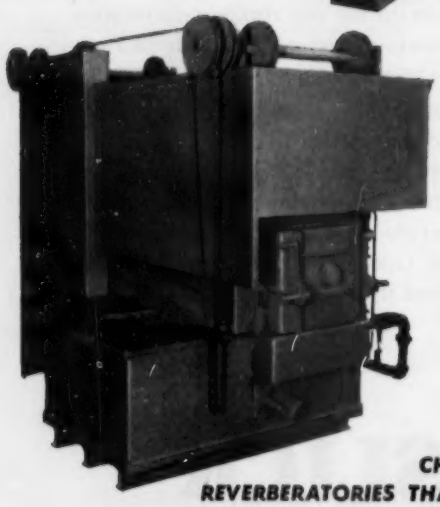


THE FAMOUS MODEL "DC" ALUMINUM REVERBERATORY FURNACE NOW AVAILABLE WITH...

Pneumatic Tilt Operation

Stroman again sets the pace in the aluminum melting field with their new TILTING TYPE "DC" REVERBERATORY FURNACE for Die Casting, Sand Casting and Permanent Mold plants. Built to specifications that assure perfect metal on every pour, they melt faster, keep metal flowing when you want it . . . are most economical to operate and maintain . . . and assure castings of only the finest quality, which means a minimum of costly rejects. Truly they are the furnaces that can handle any capacity you desire and have metal at correct casting temperature, ready for pouring at all times. Investigate their possibilities in your plant to-day.





STROMAN

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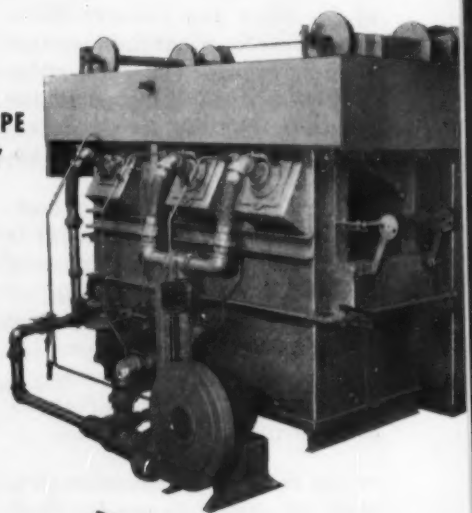

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This die casting bears the CZ symbol—proof it is made of "on grade" alloy which meets the rigid ASTM specifications.

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Model 1½G Reed Prentice, cold chamber, all hydraulic, 250 ton pressure, pot capacity 550 lbs.

ZINC—3 Model BH30 Kux Die casting machines, Hot shot type 400 ton pressure, 12 lbs. per shot, all hydraulic.

2 Model BH18 Kux Die casting machines, hot shot type, 400 ton pressure, 12 lbs. per shot, all hydraulic.

FURNACES: 5 Fisher and Bellevue 2000 & 4000 lb. zinc and aluminum melting furnaces, gas fired.

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FOR FULL DETAILS ON MACHINERY AND EQUIPMENT SEND FOR OUR FREE ILLUSTRATED BROCHURE!

Remember the date: **Thursday SEPTEMBER 9th, at 10:30 A.M.**

Remember the place: **INDIANA DIE CASTINGS INC., ELWOOD, INDIANA**

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Die Casting

enables **1** maker
to use the same **2** parts
for **3** different tools

CASE HISTORIES FROM MT. VERNON FILES

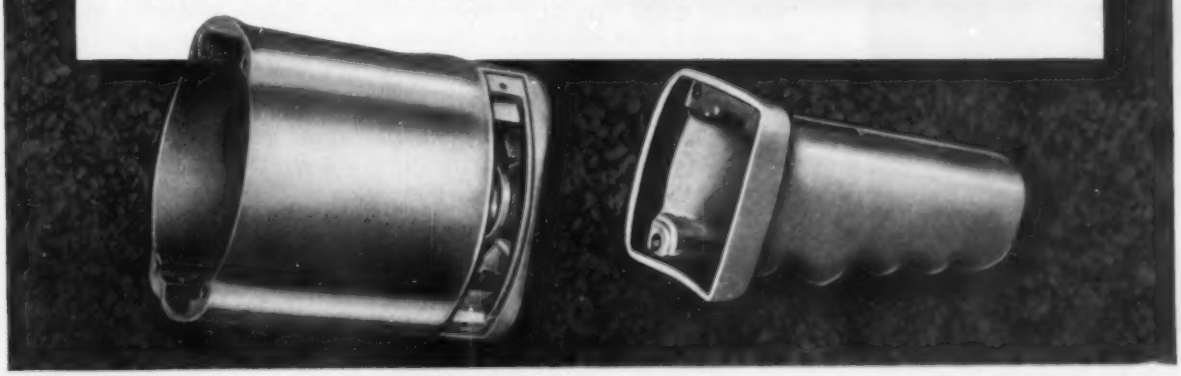
While we have introduced the economies of die casting to manufacturers in many fields, it strikes us that Millers Falls Co., Greenfield, Mass., comes closer than most to gaining the *maximum* benefits from making die cast parts interchangeable.

Among the varied line of quality electric tools they make are the three units shown above: (A) The No. 404 Portable Electric Grinder; (B) The No. 270 Polisher; (C) The No. 870 Industrial Sander. In each of these tools two identical Mt. Vernon die cast parts serve as motor housing and handle. The two parts are fastened together at different angles—but think of the savings in labor, savings in time, savings in inventory!

Other advantages inherent in these die-cast parts are light weight combined with strength to withstand the vibration and pounding these tools receive—also, even with intricate designs such as these, die casting is done to such close tolerances that machining is minimized.

Whatever *your* product, you can almost certainly profit by considering the advantages of die casting: light weight, simplicity, lower costs. Our varied experience of many years is wholly at your service. Let us know your needs today.

MT. VERNON
DIE CASTING CORP.
STAMFORD, CONNECTICUT



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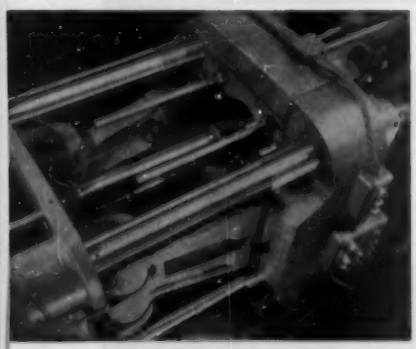
Revolutionary New Answer

Leading die casters are enjoying the highest quality and the lowest costs ever. Illustration shows a battery of LAKE ERIE machines in a plant of The ELECTRIC AUTO-LITE COMPANY.

More than 100 of these Revolutionary Lake Erie Machines have gone into service in less than 2 years



The "Wedge Cam Toggle" is an exclusive Lake Erie Engineering design.

"WEDGE CAM TOGGLE" The revolutionary Lake Erie "Wedge Cam Toggle" has provided a new standard of comparison for increased die casting production. This self-compensating toggle clamp automatically takes up clearances in the dies due to contraction and expansion of the molds during production or shut-down periods, and, at the same time, engages and disengages easily without binding. This is accomplished by the use of a circular cam contact surface together with rolls which guide the toggles during engagement and disengagement. The toggle action is actuated by a hydraulic cylinder which provides smooth, rapid opening and closing.

"PRESSURE-PAC" This patented unit consists of automatic pressure booster in the hydraulic circuit between the accumulator and the injection cylinder. It provides the necessary pressure to feed the shrink or compress the porosity at the time of solidification of the metal. The standard unit is arranged for 2-to-1 pressure increase. Special units are available for higher pressure ratios.

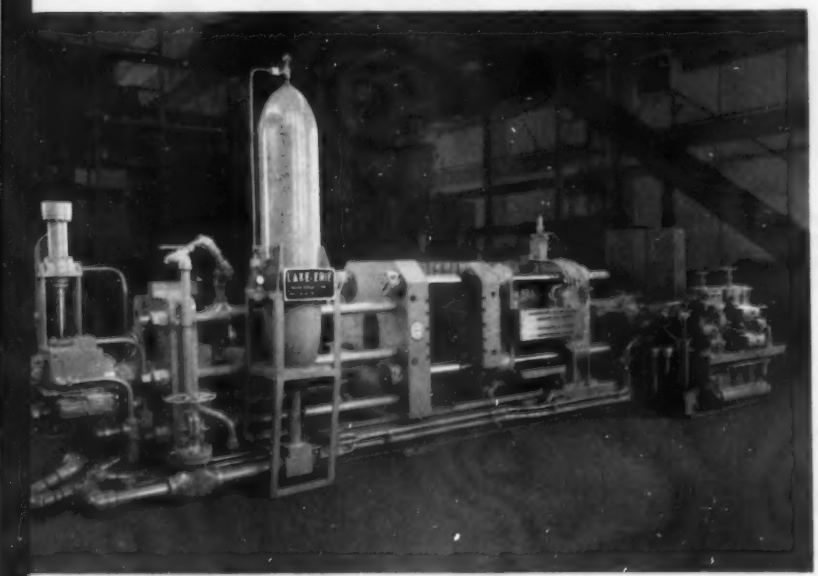
To Die Casting Problems

by LAKE ERIE ENGINEERING CORP. BUFFALO, N.Y. U.S.A.

... these new die casting machines have increased production 15% to 25%

Lake Erie's patented "Wedge Cam Toggle" and "Pressure Pac" injection unit provide the industry with the first major improvements in die casting machines in many years. In addition to these two *exclusive* contributions to improved production, Lake Erie Die Casting Machines incorporate a number of other engineering advancements—all of which combine to give you die casting equipment which through its increased earning power makes other machines obsolete.

These industry-proven Lake Erie Die Casting Machines are available in 10 models, ranging from 100 to 1000 ton capacity and for casting all the usual non-ferrous metals and alloys.



With all shrouding removed the clean, sturdy construction of Lake Erie Die Casting Machines is self-evident. All parts easily accessible. Model shown is standard AH-60P cold chamber machine rated 600 tons.

OPERATING FEATURES

- **Patented "Wedge Cam Toggle"**
  Self-compensating adjustment for heat expansion.
  Increased hourly production due to positive clamping pressure during each machine cycle.
- **Patented "Pressure Pac"**
  Feeds the shrink or compresses porosity during solidification of aluminum, magnesium and brass.
  Irons out the skin surface gas lines. Provides denser castings.

Simplified maintenance of all elements including manifold valve block. Faster job set-up. "Jack Screw" pedestal mounting of the injection cylinder facilitates faster change-over from high or low positions of the injection sleeve. Pushbutton control. Automatic continuous cycle or a single cycle operation available. Hydraulic core pulls may be operated on four sides of the platen. Electrical interlock with core-pulls prevents die jam.

Write for this Catalog

Illustrations, specifications, application data—all are here in complete detail with full explanation of the patented "Wedge Cam Toggle" and "Pressure Pac" production advantages.

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LAKE ERIE 2

DIE CASTING

IS THE PROCESS

ZINC

THE METAL

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THE PREFERRED ZINC

Die casting—the shortest distance between raw material and finished product—is a precision process capable of producing from the raw material the most complex parts in nearly finished form at a single operation.

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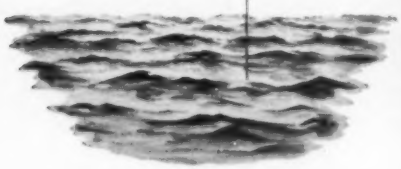
LISTENING FOR ENEMY SUBS – INCO precision casts an intricate part of sonar equipment operated from this Bell Aircraft Corp. HSL-1 U.S. Navy helicopter.



TWO parts instead of six

How INCO Precision Casting cuts cost of underwater ears for helicopters

The Navy now puts underwater "ears" on helicopters for sub hunting.

Each "ear" is a remote control sonar device that is suspended in the water from the end of a cable. On this "ear" there's a collar holding a stabilizer that stops rotary motion.

This collar, at the outset, gave Texas Instruments, Incorporated plenty of trouble. Made of six parts, it cost too much to produce. Its two main parts were machined from bar stock. Four paddle brackets were machined from weldments. (Blanking, forming and pre-machining were also needed to produce these weldments.) After finish machining, all six parts had to be assembled with screws.

The Texas Instruments people thought of casting as a possible solution. They passed the problem to INCO. INCO casting specialists were able to show them almost at once that precision investment casting could *greatly simplify production of this collar.*

In fact, INCO precision casting reduced the six parts to two; eliminated all blanking, forming, pre-machining and welding; lessened finish machining; and made final assembly of the collars far easier.

And INCO was able to help even more. These collars had to be made of a metal that was substantially nonmagnetic, castable, machinable and able to resist corrosion by sea water and atmosphere. When the Texas Instruments engineers put this problem to INCO, too, they found there *was* no problem . . . Inconel® suited each of these needs.

If *you* want to know more about the kind of production problems that have been solved with INCO precision casting, write for the folder "A MACHINIST'S NIGHTMARE BECOMES A DESIGNER'S DREAM."

THE INTERNATIONAL NICKEL CO., INC.
67 Wall Street New York 5, N. Y.

Where can you cut costs with INCO Precision Casting?

Wherever you have a part which is 6 inches x 5 inches or smaller, weighs under 3 lbs., requires starting tolerances as close as plus or minus .005 inch per linear inch, and needs 5 or more fabrication steps, there's a good chance you can save by having it precision cast.

5 Advantages of
INCO Precision Castings

Save up to 60% of production costs.
Longer life with harder alloys.
Little or no machining required.
Wider design latitude.
Higher alloys at lower cost.

INCO Precision Casts most high-melting point alloys from Carbon Steel to the New Super Alloys.

Inco Castings *Precision, Sand, Centrifugal*

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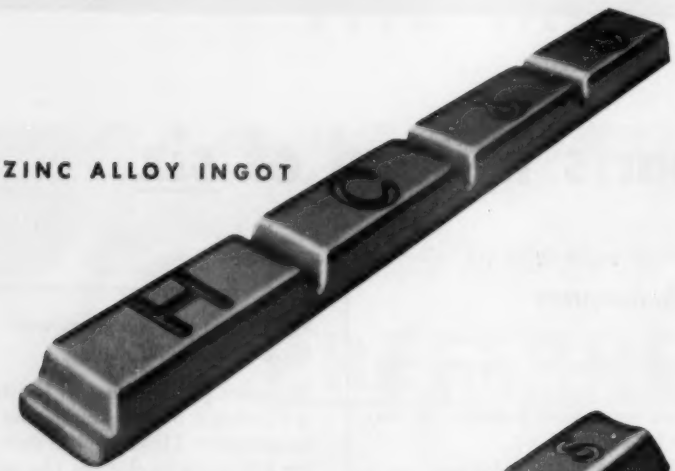
DEPENDABLE SUPPLIERS SINCE 1932

H. COHN & SONS, INC.

Quality Zinc & Aluminum Alloys

ZINC ALLOY INGOT



ALUMINUM ALLOY INGOT

Your inquiries will receive prompt attention.

Rigid Quality Control. Every step in the process of preparing and alloying metals is handled with the utmost care to assure highest quality ingot.

Uniformity of Alloys. You can depend upon the consistent and uniform quality of our alloys at all times.

Spectrographic Control. The most modern instruments and equipment have been installed to analyze and control our alloys.

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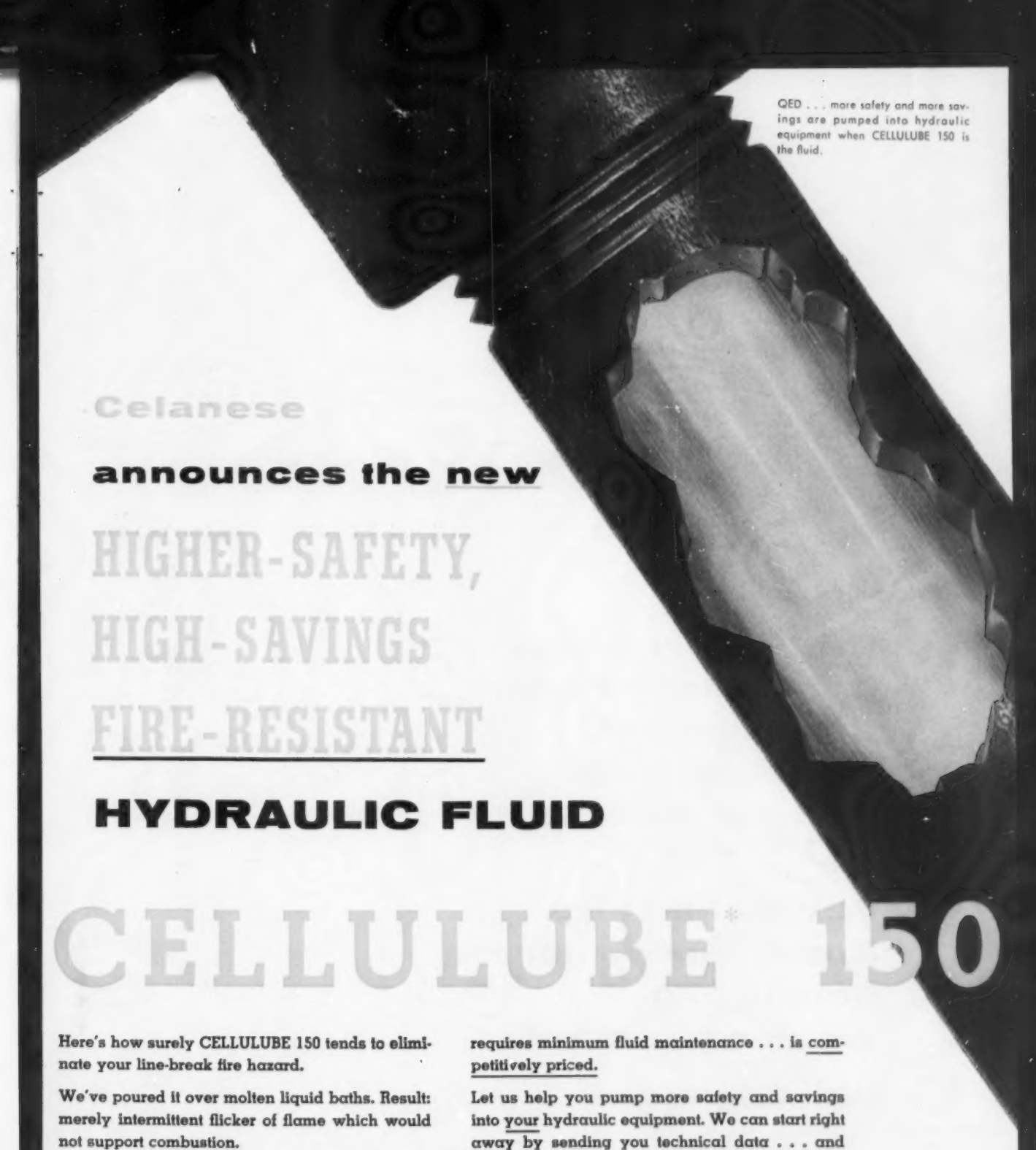

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Celanese

announces the new

HIGHER-SAFETY, HIGH-SAVINGS FIRE-RESISTANT

HYDRAULIC FLUID

CELLULUBE* 150

Here's how surely CELLULUBE 150 tends to eliminate your line-break fire hazard.

We've poured it over molten liquid baths. Result: merely intermittent flicker of flame which would not support combustion.

We've atomized CELLULUBE 150 into hot metal flame-heated to approximately twice the temperature at which petroleum based fluids spontaneously ignite. There was no ignition with CELLULUBE 150.

In addition to providing such outstanding fire resistance, CELLULUBE 150 assures excellent lubrication . . . is non-corrosive, non-reactive, chemically stable, long-lasting . . . contains no additives . . . has a high boiling point (approx. 790° F.) . . . requires minimum fluid maintenance . . . is competitively priced.

Let us help you pump more safety and savings into your hydraulic equipment. We can start right away by sending you technical data . . . and supplying answers to your specific hydraulic fluid problems. Your request will get prompt attention.

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THE NEW ENGLAND DIE CASTING CO.

445 Front Ave. West Haven, Conn. • P. O. Box 1281 New Haven, Conn.

DIE CASTING
forecast issue

Who Will Use Tomorrow's Die Castings?

CAN the die casting industry continue its expansion and, if so, in what direction will this growth occur?

The die casting industry, since its inception, has been closely linked with the auto industry . . . still the largest buyer of die castings. Die castings have, in fact, helped to make today's moderately priced automobile a reality; conversely, the existence of a major customer like the builders of automobiles has stimulated the healthy development of the die casting industry.

But over the past several years, die castings have been going into a more widely diversified field of manufacture . . . industries as dissimilar as heavy machinery and toys, refrigerators and textile findings, scientific instruments and kitchen gadgets.

Technical advances in die casting methods and equipment have contributed to the expansion of the industry by making possible die castings of quality, size and physical characteristics to meet the needs of more and more types of products.

The auto industry will continue to use more die castings . . . some models are reported to have 20 percent more die castings in 1954 than in 1953. Torque converters, power steering, and other devices will account for many more die castings. But, in addition to this, die castings will go into industries representing the entire cross-section of American metal working.

Die castings, which reduce and eliminate expensive machining and secondary operations, will find greater use as American manufacturers look for new ways to cut costs.

52. Metals—Zinc, Aluminum, Magnesium

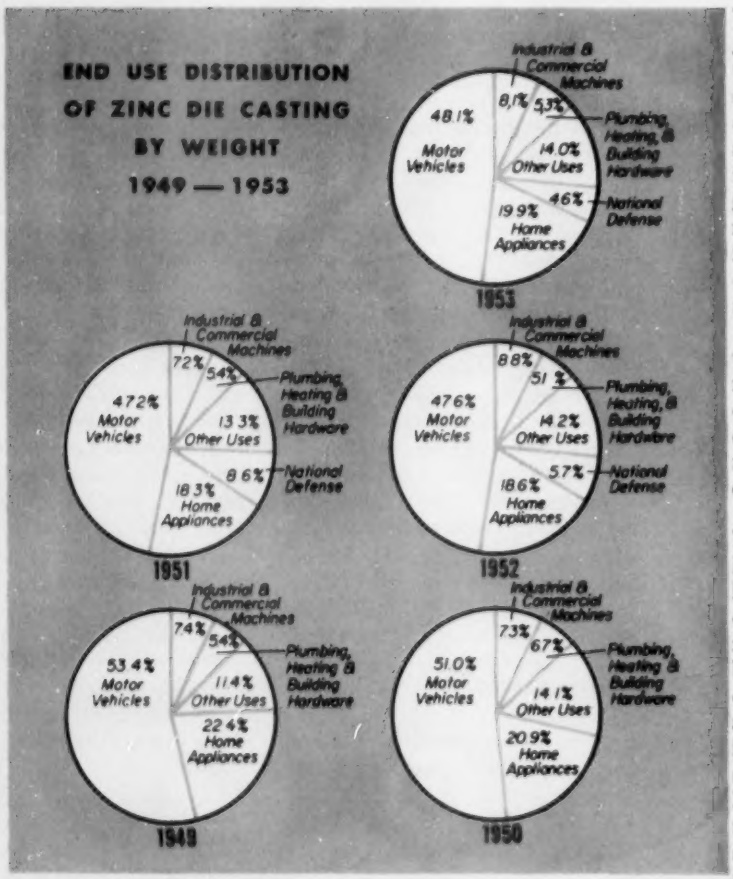
60. Equipment—Die Casting Machines

62. Applications—Die Castings Tomorrow

DIE CASTING
forecast issue

ZINC: supply good

By ERNEST V. GENT
Executive Vice President and Secretary
American Zinc Institute, Inc.



Source: American Die Casting Institute

1. WHO USES zinc die castings? Here is a series of charts to indicate the trend in usage over the past five years. In 1953, total tonnage registered a new high.

FROM every angle of view, the picture looks favorable to present users or to anyone contemplating the use of zinc alloy die castings. The availability of ample supplies, the fact that zinc alloys provide the greatest number of desirable mechanical properties and casting characteristics at the lowest cost, all favor the user now and for the foreseeable future.

The price of zinc, in company with other strategic materials, reached a high point at the peak of the defense program, but has declined to lower levels much more favorable to the user of die castings.

The supply of slab zinc has been steadily increasing. Stocks held by U. S. smelters are at the highest point in years and production has been maintained at near record levels. Imports have been substantial and added to domestic production have resulted in a total supply exceeding demands even though consumption is at an excellent rate. In addition, the federal government has accumulated a substantial tonnage of slab zinc for the national stockpile for emergency use.

The present situation of low prices and high supply offers the obvious advantages of reduced costs and prompt delivery to those users who wish to avail themselves of the physical and economic advantages of zinc die castings. The question of

d — uses increasing

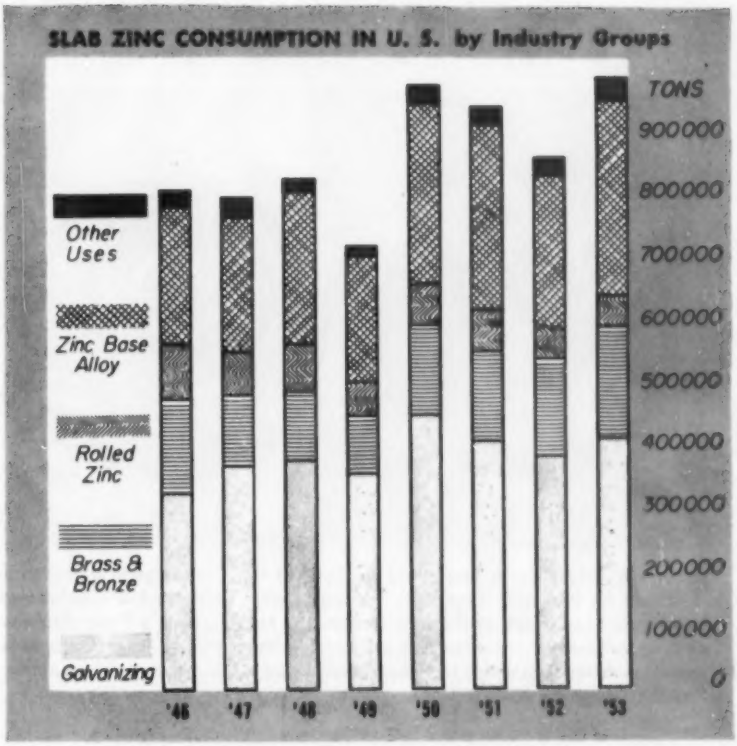
whether these conditions can be expected to continue for some time can be readily answered in the affirmative.

It is generally conceded that reserves of zinc in the ground are considerably larger than any published figures while production of slab zinc here and abroad is at an expanding rate. There is every evidence that zinc will be readily available to more than match any reasonable estimate of requirements of the U. S. consumers for many years to come and that it will be moderately and competitively priced.

New High Record

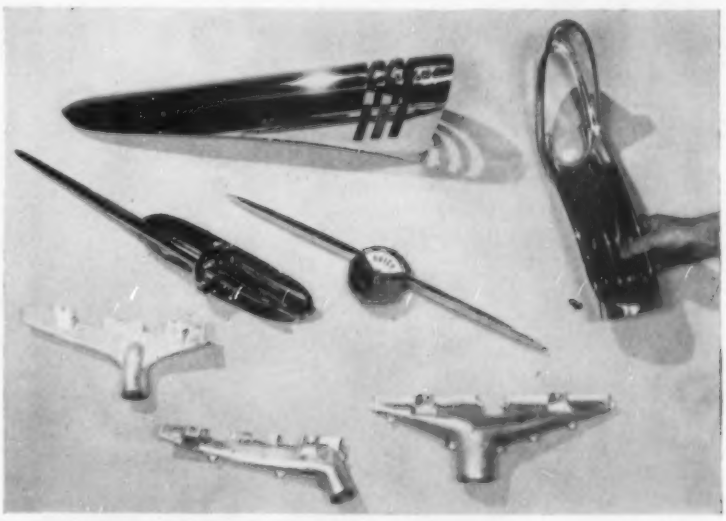
The end use charts in Figure 1 are based upon the analysis of one important section of the industry that is indicative of the entire consumption pattern. The total zinc alloy sales in 1953 were in the neighborhood of 300,000 tons (see Figure 2) and thus set an all-time record high.

Zinc alloy die castings are enjoying considerable favor in applications in the automotive industry. Usage of zinc die cast parts by motor vehicle manufacturers in 1953 was close to the 1950 figure, the previous high. A cursory investigation of zinc die casting usage on the 1954 passenger cars reveals that this year may establish a new record. The new Buick, Super, four-door, for example, employs 21



Source: U.S. Bureau of Mines

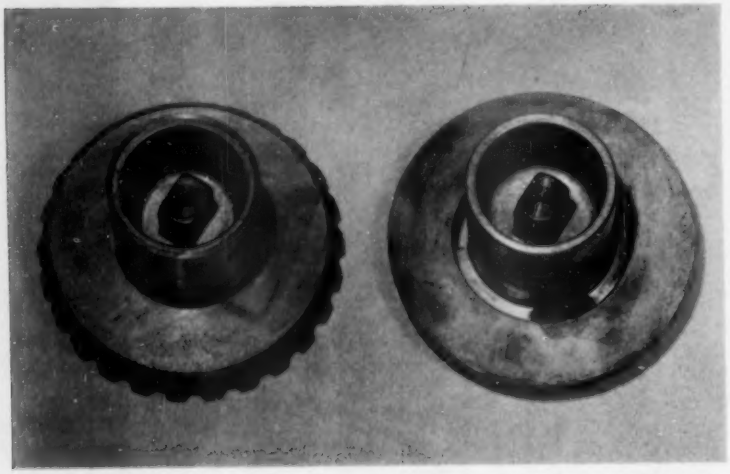
2. HOW MUCH of the total slab zinc consumption goes into zinc alloy die castings? The breakdown indicated above shows this to be the second largest use for the metal.



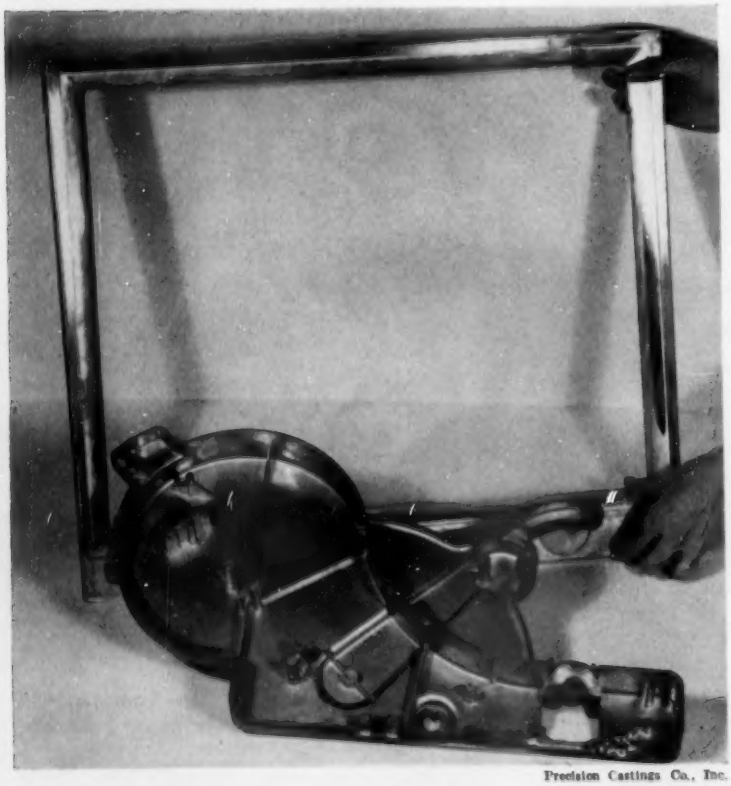
3. TYPICAL AUTOMOTIVE die castings are these from the 1954 Buick. Two at top form the tail lamp assembly for the Buick Skylark. Buick use of die cast zinc is up 21 percent over 1953.

Why Zinc? ——→

Typical Zinc Die Castings . . .



4. BEVEL GEAR for a household washer has been redesigned (right) to include an integrally cast hub. Previous design (left) used a tubular steel insert cast in position. In the new design, the hub is given a flash chromium coating, whereas the former hub required finish grinding. Apex Rotarex reports the plated hub wears better in a powdered metal bearing than anything else the company has tried.



Precision Castings Co., Inc.

5. CLOSE DIMENSIONS are held, even in zinc die castings as large as these: the TV bezel for Sylvania Electric Products and the cover for a recording machine mechanism for Rudolph Wurlitzer Co.

percent more zinc alloy die castings than did its 1953 predecessor. A few examples of Buick usage are shown in Figure 3.

Application in the home appliance field, too, is on the upswing; the 1953 distribution is only slightly below the 1950 high. An interesting home appliance use is the washing machine bevel gear pictured in Figure 4.

Of particular significance are the figures for industrial and commercial machines; this end-use classification jumped in 1953 to a new high in zinc die casting usage.

Continuing Trend

The swing to zinc alloy die castings appears at the moment to be of a continuing nature. Price and availability are really only part of the story. Advances in technology and equipment have much to do with the establishment of this definite trend.

Castings not regarded as feasible a few years ago are entirely practical today with the improved equipment and practices. Larger zinc die casting machines permit castings even larger than those pictured in Figure 5. Faster small machines make their contribution to greater use of die cast zinc by helping to reduce the cost of small castings.

Special Advantages of Zinc

There are other factors, aside from relative metal costs, entering into the selection of a die casting alloy for any given application which should be kept in mind.

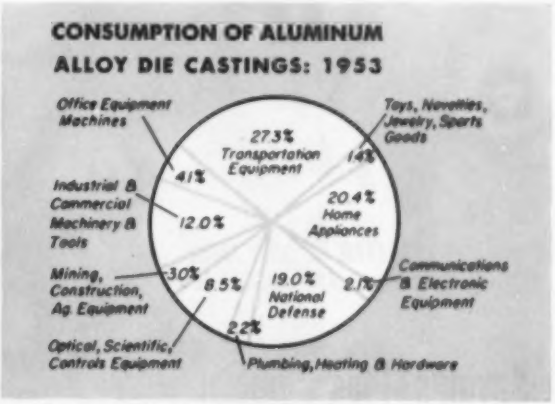
The most outstanding characteristic of the zinc alloys is their ease of finishing. Electro plated coatings are easily and economically deposited on zinc die castings with a minimum of surface preparation. Aluminum and magnesium die castings have been electroplated successfully but the cost of this operation is considerably in excess of that for zinc.

Continued on page 127

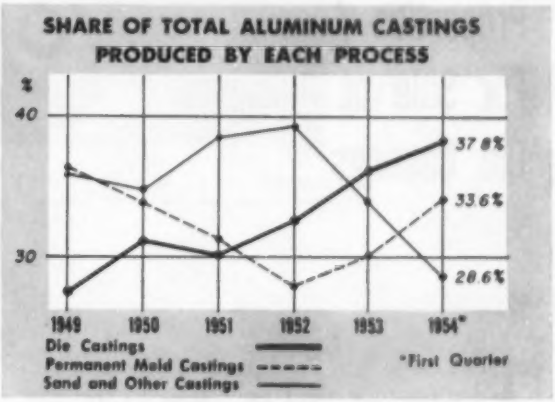
DIE CASTING
forecast issue

ALUMINUM

...trend is toward larger die castings



Source: American Die Casting Institute



Source: Bureau of Census, U.S. Dept. of Commerce

By **CARL H. BURTON,** Secretary
Aluminum Smelters Research Institute

A SURVEY of the figures reported in the Bureau of Census "Facts for Industry" shows that in 1947 die castings accounted for 24.9 percent of all aluminum castings shipped in that year. In 1953 the proportion had increased to 36.3 percent, and for the first four months of 1954 it had grown to 37.9 percent.

These healthy advances had all been accomplished before the advent of the new 72" die casting machine which has just been announced.

This major advance in the size of die casting equipment can only open new fields for die castings, fields which have been closed, up to this time, through machine limitations. Many applications which have been impossible or impractical heretofore can now be expected to appear as die castings.

As designers adjust their plans to fully utilize enlarged equipment, tonnage of aluminum die castings will inevitably increase. Further increases in machine sizes can readily be envisioned. One thing is certain — engineers will design to the use of larger die cast units only when the production facilities are available.

The adoption of torque converters and automatic transmissions by the motorcar industry brought increased demands for larger die castings. These parts are indicative of how new and larger applications appear in established industries.

With the coming of new light weight rail cars it is to be expected that applications will expand still further into comparatively new conceptions. Other fields such as electronics, materials handling equipment and communications offer similar fertile fields.

Refinement of old and the development of new alloys can be expected from time to time. These are not much talked about during the development stages, but such work is constantly being carried on in many laboratories. The same is true with respect to finishes and finishing techniques.

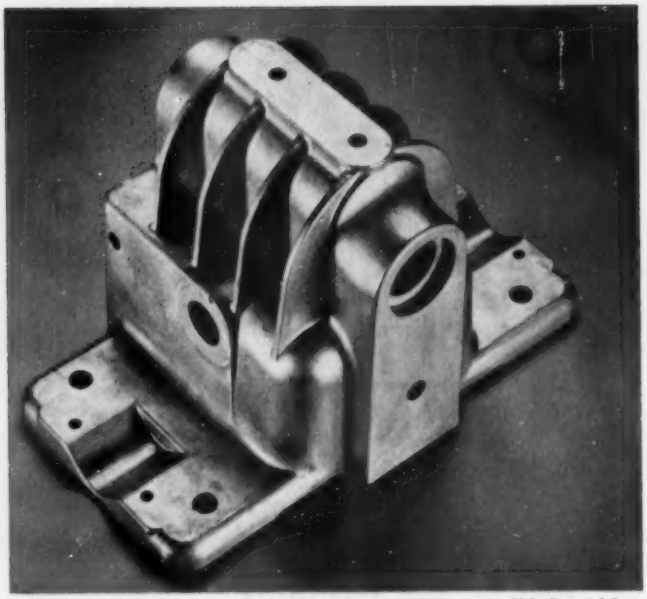
The outlook is ever expanding, and it begins to appear that the future is limited largely by the degree to which we suppress our imagination.

• • •

Why More Aluminum Die Castings?

DIE CASTING
forecast issue

Savings Plus Special Properties Account For Sale of Aluminum Die Castings



Globe-Imperial Corp.

GEAR CASE for operating overhead garage doors by remote control combines strength, accuracy and low cost.

TO LOOK into the future of aluminum die castings one need only look at the past. Acceptance of aluminum in die cast form has been rapid, both for its engineering properties, its economy and its production simplification.

The public has long since been sold on aluminum as a household material; the portable tool and outboard motor industries have found it indispensable; the aircraft industry has made important use of it; and even the penny-pinching automotive industry buyers have made impressive use of this metal.

The curves shown on page 55 show most clearly the trend in the application of aluminum die castings. With only a minor upswing in 1950-1952 aluminum sand castings have shown a steady decline in use while die castings have had a remarkable upswing. That this is not a short time trend is indicated by the uniform rate at which use has increased.

The uses to which aluminum die castings are being put covers the entire cross-section of industry. A chart on the preceding page shows the approximate percentage of the total production that is consumed by each industry group.

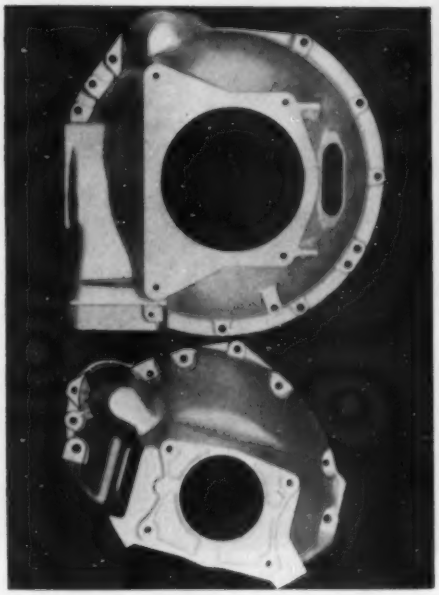
In the transportation field, the increasing use of automatic transmissions has greatly increased consumption of die castings. Here the need for die casting machines that could produce larger castings was amply met by the equipment builders with the result that castings such as the torque converter housings shown above are now commerciably feasible and are in production.

While the light weight and high strength of the die cast aluminum alloys accounts for major applications in the portable tool, business machine, aircraft and other fields where weight is at a premium, still responsible leaders in the metals industry have expressed the opinion that the greatest potential uses for aluminum die castings will come strictly on a cost saving basis in competition with other engineering materials.

Special instances where the corrosion resistance of aluminum alloy with either its naturally-formed oxide surface or an anodically-formed oxide coating are desired, will represent another area for expanded use of aluminum die castings. These include the tremendously growing market for aluminum builders hardware, marine equipment and many types of industrial equipment exposed to atmosphere.

Another important attribute of aluminum die castings that has influenced their usage is the dimensional stability characteristic of these castings. The photographic and optical goods industries, along with manufacturers of other types of scientific equipment, depend upon aluminum die cast mountings, housings and frames where precision alignment and close dimensional relationships must be maintained over long service periods.

Progress in improved surface finishing methods for aluminum die castings has further broadened the applicability of this material. Not only is aluminum inherently resistant to corrosion, but means have been developed for en-



TORQUE CONVERTER housings are outstanding among aluminum die castings that account for increased tonnage use.

Aluminum Company of America

AIRCRAFT DIFFUSER plate is a highly complex piece, using knockout cores, and represents new aircraft application.

hancing this property by conversion coatings, anodizing and organic coatings. Of course, the fact that aluminum has a white gleam and a durable nish by simple polishing and buffing is an economic factor in its favor.

However, where chromium plating is required, as in the automotive, appliance and other products, techniques are currently being explored to achieve chromium plating on aluminum die castings at acceptable costs. So far, only one production aluminum die casting is known to be chromium plated in the auto industry . . . largest buyer of chromium plated parts . . . but certain photographic and home appliance firms have bought chromium plated aluminum die castings for years.

Methods of fastening that depend for their success on a combination of relatively low hardness and high tensile strength have again broadened the field of application of aluminum die castings. Self tapping screws, threaded inserts and spring type fasteners have all aided. Since reduction of manufacturing costs is one of the prime efforts of product designers, a die castable metal that can use high speed fastening devices offers a double barrelled cost reduction possibility.

A limitation in application that has plagued die castings in general has been the inability to weld or braze cast components. Here again, recent developments have clearly shown that aluminum die castings can be successfully brazed and welded. This development should materially expand the applicability of aluminum die castings into fields which were, heretofore, completely closed to these products.

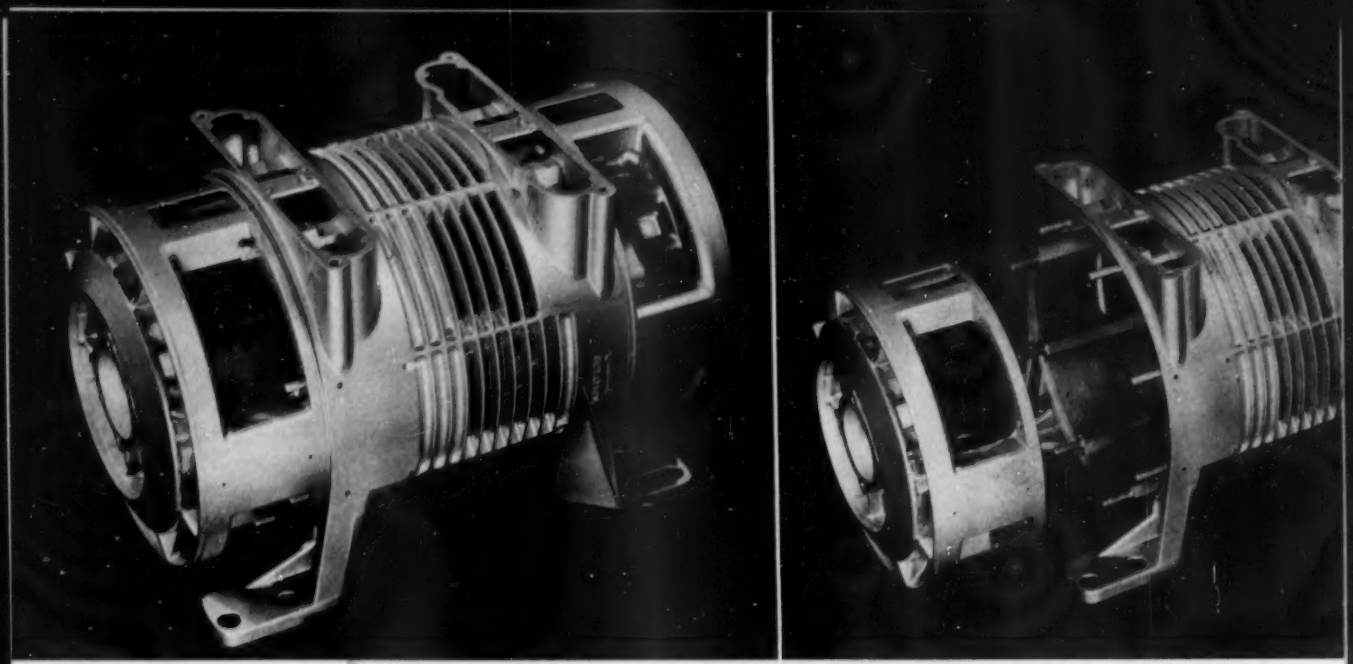
Highly stressed parts are not normally designed as aluminum die castings. When, however, properly designed aluminum die castings are compared with sand cast iron both laboratory and field tests show that aluminum die castings will give as good service as their cast iron predecessors. The importance of this lies in weight saving primarily.

In the automotive field, for example, the large number of automatic devices in use today have so increased the engine and transmission weight that the proper distribution of weight between front and back axles has been lost. Anything that will lower front end weight is, therefore, highly desirable from the automobile designer's standpoint.

Density, a property sometimes considered to be absent from die cast metals because of the rapid surface chilling that occurs in the die, can be obtained in aluminum die castings when section design and detail are favorable. The increased use of aluminum die castings where low to moderate pressures are applied, or submersion in water is a condition of operation, attests to the ability to die cast aluminum with a sound internal structure.

Even in cases where size, shape or design of a piece necessarily result in internal porosity, low cost impregnating techniques have been developed which enable the use of die cast aluminum. Not only have many military items been

Continued on page 104



MAGNESIUM DIE CAST inverter housing manufactured by Jack & Heintz, Inc., shown with end bells attached and in exploded view.

By E. L. SCHAPER
Magnesium Department,
The Dow Chemical Co.

THE use of magnesium die castings has shown a significant increase over the past five years. The increase is significant because it has been largely in the commercial field with the greatest single gain being shown in the automotive field. A part of this activity must be attributed to periodic shortages of aluminum and zinc; however, the fact that the change could be made from aluminum to magnesium with no changes in dies or machines, and the fact that in a large number of cases magnesium represented a definite cost saving over the other metals, has increased magnesium consumption markedly.

Through actual experience and use, many companies have, for the first time, had the opportunity to examine the true cost saving effected by using magnesium. Magnesium has too often been examined on the basis of the cost saving of the casting alone, and such factors as excellent machinability and light weight have been overlooked. In considering cost saving in the finished product, in a number of cases, the saving in machining alone has been as great as the cost of the casting.

The light weight of magnesium is an important consideration in final assembly. With the increased usage of larger castings, particularly in automobile automatic transmissions, the weight of the magnesium part sometimes reaches 10 or 11 pounds. The same casting in grey iron or zinc would weigh 44 pounds. In using magnesium the parts can be moved through the manufacturing process by hand whereas in the case of the heavier metals mechanical handling would be required.

Another of the advantages of using magnesium die castings is the ready adaptability of the magnesium parts to existing parts and processes. From the standpoint of strength and design, a direct substitution of magnesium for the other metal was possible. In some cases, such as the torque converter and clutch housing for automatic transmissions, full weight advantage of magnesium over cast iron is realized.

DIE CASTING
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MAGNESIUM:

...die castings enter the automotive field

Corrosion experience on magnesium die castings has proved that it is a minor problem. A large number of parts have been used by the automotive industry with no corrosion complaints on production parts. In one test case, an unpainted torque converter and clutch housing were assembled with no insulation against galvanic corrosion. After three years of service under all conditions including salt road splash, the manufacturer reported that corrosion of the magnesium was not of suffcient severity to limit its application even under such unusual conditions.

The recent development of new chemical treatments and improvements in paints and primers have almost entirely eliminated the corrosion problem.

Fields of Application

The greatest increase in the use of magnesium die castings has been in the automotive field. One manufacturer has indicated that the very nominal use of 30 pounds of magnesium on each automobile could require during a normal production year a total of 250 million pounds of magnesium. Present levels of use do not total near that figure; however, increasing acceptance of magnesium by the manufacturers has been reflected by steadily increasing consumption.

Some of the parts that have been used in automobiles include starter and generator end plates, clutch and torque converter housings, internal transmission parts, instrument panel housings, speedometer bezels, fan spacers, oil seal plates, steering column brackets, collars, and shrouds, convertible top hinges, rails and pillars and a number of other parts.

A comparatively recent high production consumer product utilizing die cast magnesium is the pocket measuring tape. The case of this tape is made of two halves of chrome plated die cast magnesium. Besides the advantages of light weight, ease of machining and platability, in drop tests magnesium proved to be extremely durable as compared to competitive designs and materials.

Another manufacturer is utilizing die cast magnesium for his carpenter's level. In this instance, the greater accuracy and decreased finishing costs made the die cast level cheaper to produce as compared to a permanent mold casting.

Portable tools have been using die cast magnesium components for a considerable period of time. This field is particularly suited to the use of magnesium in that any tool that must be operated and lifted by hand is made more portable by the use of light weight magnesium.

One of the newest of applications is in the tank-type vacuum cleaner. In this case magnesium is used to a definite advantage in the suction system impeller. The motor end frames and impeller housing are also magnesium. The light weight of magnesium in the impeller permits a degree of speed and vacuum unattainable in other designs or impellers made of other materials. The centrifugal force which causes an impeller to fail is a product

Continued on page 114

DIE CASTING
forecast issue

Design Trends Die Casting

SALE OF DIE CASTING MACHINES

	Tons	1952	1953	1954*
HOT CHAMBER	-100	52	64	72
	101-250	16	16	2
	251-400	5	27	16
	401-500	19	22	32
	501-750	5	20	28
	751-1000	4	4	—
	Total	101	153	150
COLD CHAMBER	-100	4	1	2
	101-250	12	16	12
	251-400	38	43	22
	401-500	17	27	48
	501-750	21	39	62
	751-1000	5	16	10
	Total	97	142	156
TOTAL HOT & COLD	-100	56	65	74
	101-250	28	32	14
	251-400	43	70	38
	401-500	36	49	80
	501-750	26	59	90
	751-1000	9	20	10
	Total	198	295	306

THE old adage that supply follows demand holds as true in the sale of die casting machines as it does in the sale of men's neckties.

As the designer of today's metal products has become convinced that he can use die castings in new ways . . . such as larger and more complex pieces or perhaps thinner-walled, better-surfaced pieces . . . the die caster has found ways to meet the demand.

It has forced the die caster, in turn, to ask the machine builder for new machine features, greater flexibility and improved performance; it has also influenced him strongly in choosing the size and type of machine for his plant.

To trace these trends, the editors of PMM have surveyed the builders of die casting machines concerning the number of units of various sizes and types they have sold during the past several years. On the basis of replies received from twelve manufacturers, the charts on this page were prepared.

Although the builders of die casting machines do not agree among themselves as to the proper classification of machines, an arbitrary breakdown has been used here based upon tons of locking pressure.

According to statistics just released by the U. S. Department of Commerce (*Facts for Industry*, July 14, 1954), a total of 341 die casting machines valued at $6,358,000 were shipped in the United States last year. In the preceding year, 229 machines valued at $3,422,000 were shipped. Figures were based on reports from the manufacturers.

*Projected 12 month total on the basis of first six months reported for 1954.

Influence Machine Sales

TREND IN DIE CASTING MACHINES

NUMBER

	1950	1951	1952	1953
Number of Machines	313	294	229	341
Value	$4,694,000	$4,707,000	$3,422,000	$6,358,000

Source: U. S. Department of Commerce

HOT CHAMBER VS. COLD CHAMBER

	1952	1953	1954*
Hot Chamber	52.8%	53.1%	49.7%
Cold Chamber	47.2%	46.9%	50.3%

Source: PMM Research Department
*Based on 6 months report

The fact that *value* of units shipped increased nearly 100 percent while *number* of units increased only 49 percent appears to be due principally to a trend toward larger machines in place of the intermediate capacities. Checking this against the PMM tabulation, it can be verified that sale of machines in the range of 401 to 750 ton locking pressure rose by 174 percent between 1952 and 1954, while the sale of machines in the 101 to 400 ton group dropped about 27 percent. These figures pertain to both hot and cold chamber machines.

Another interesting trend to be noted from the PMM survey is the rate at which small die casting machines are gaining acceptance. Reported sales show an increase of 32 percent for this smaller-rated unit. Apparently this small capacity machine takes part of the load away from large machines on which small sized castings are often uneconomical. A small machine installed along with a group of larger machines is reported by some to increase the flexibility of operation. It also may indicate a trend toward the replacement of small screw machine, stamped and cold formed pieces by die castings.

How do sale of hot chamber units compare with sale of cold chamber units?

Both had a steady increase between 1952 and 1954, but cold chamber machines have had the greater gain. This is indicated by the fact that while machines for casting zinc are up by 49 percent between 1952 and 1954, machines for casting aluminum and magnesium are up 61 percent.

Does this foreshadow a replacement of zinc by aluminum? The answer is apparently "No", inasmuch as both are still growing. It should be remembered that the die casting of zinc antedates the die casting of aluminum by many years, and that aluminum and magnesium are only now reaching the relative position of importance that zinc has occupied for many years. Certain specific automotive jobs, of course, account for stepped up tempo of sale in large capacity cold chamber machines. Best known among these are the several die castings used in automotive torque converters. While all three metals will be die cast in increasing tonnages, the introduction of new design projects is responsible for the current spurt in light metal die casting.

In another survey among 140 die casting plants, reporting a total of 1104 die casting machines installed as of 1953, PMM found that 771 machines were bought from machine builders, 333 were built by the die casters themselves. As new features and greater flexibility have been made available by the machine builders, there is a trend away from the "home-made" machine.

These 140 die casting plants indicated a ratio of three hot chamber machines to two cold chamber, although no information is available on length of time each has been in operation and the rate of obsolescence.

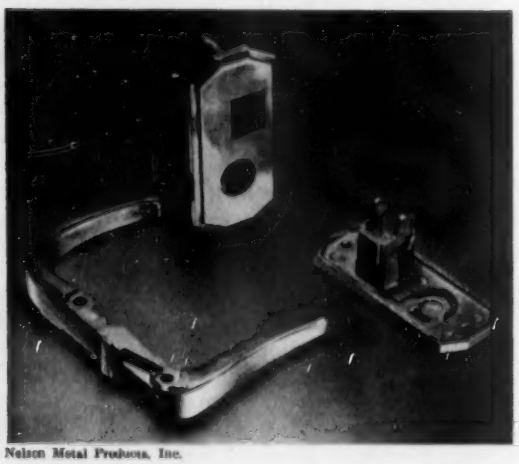
Whatever the conclusions to be drawn from the tabulated figures derived in this PMM survey, it must be admitted that evidence is clear-cut that the die casting industry is a healthy, growing field; that it is meeting the increased demands of its customers for better and more difficult castings; and that the practitioners of the die casting art are, themselves, optimistic over the future of their industry.

DIE CASTING
forecast issue

Some of

TOMORROW'S DIE CASTINGS . . .

Aluminum Builders' Hardware



Nelson Metal Products, Inc.

Tomorrow: Aluminum storm doors and windows are among the fastest growing items in domestic building supplies. Consumers like the appearance, durability and low maintenance requirements of screens, storm windows and doors made of aluminum. An executive of a large metals company recently reported this to be one of the outstanding new uses for aluminum. Die castings in aluminum are helping to make this trend possible because most hardware used to complete these units is die cast.

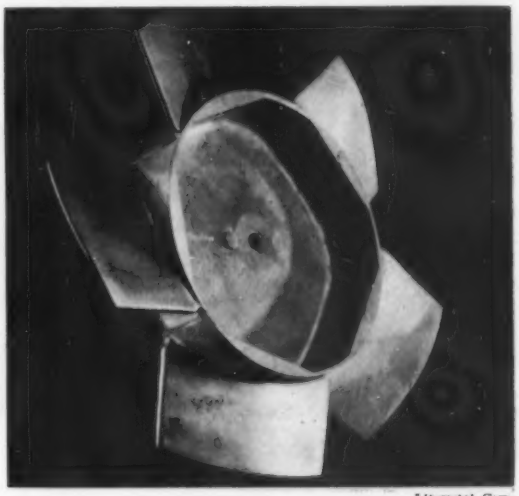
Example: Engineers at Newell Manufacturing Co. have chosen die cast aluminum door handles and escutcheons, both interior and exterior, because they have — 1) good strength, required for the pull handles; 2) attractive appearance as polished; 3) close match in appearance with the extruded aluminum used for framing; 4) no rust or maintenance problems in keeping the attractive appearance.

The die cast aluminum door hardware requires no machining or preliminary work . . . just assemble as received from the die caster. The complex details needed for operating the door handle are all provided integrally in the die casting; the mounting, fastening and locating surfaces needed are all accurately cast.

Tomorrow: Replacement of other materials promises to call for wider use of die castings. Principal reason for these conversions may be cost, but there will also be many cases where superior performance, better appearance, ease of finishing, simplification of product construction will enter the picture.

Example: A bus heater fan, previously molded in a plastic material, has been redesigned as an aluminum die casting. It is a superior product at a lower cost because it has greater strength and stability in service, needs less balancing, and less secondary machining.

Replacement of other materials



Ltemetal Corp.

Tomorrow: The radio and electronics industry is a true symbol of the 20th century and will find thousands of new civilian and military applications. Large quantities, close accuracy and adequate protection for delicate mechanisms are all related problems in housing and mounting electronics.

Example: This base for a portable radio is very light in weight, but stronger than any alternative material. Thin walls are ribbed for stiffness, while mounting bosses, cored holes and assembly pads are formed accurately in the die casting.

Radio and electronics

Cleveland Hardware & Forging Co.

Tomorrow: Business machines are produced on a big quantity basis, and the trend has been away from heavy, rough sand cast components in favor of lighter, smoother, more accurate die castings. Frames, cams, links, gears, housings, bases and control knobs are among the more common die cast business machine parts.

Example: These duplicating machine tanks to hold liquid are die cast in zinc because of accuracy, durability and economy. The parts are furnished with all holes cored, needing no machining.

Business Machines

Advance Tool & Die Casting Co.

DIE CASTING
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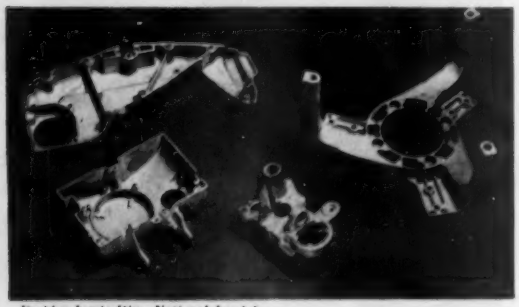
Magnesium Die Castings

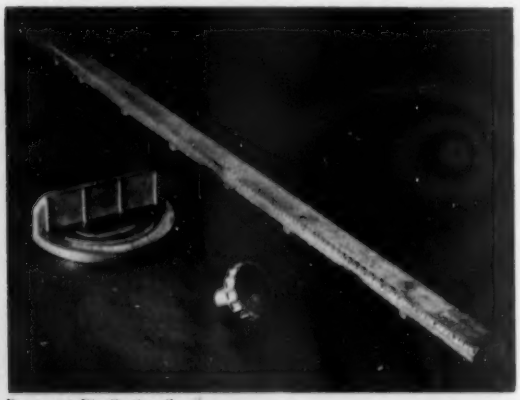


Doehler-Jarvis Div., National Lead Co.

Tomorrow: Magnesium die casting techniques have been advanced to the point where this light weight metal can now be cast in production quantities at low cost. Many industry groups are showing increased interest in the high strength-to-weight ratio of magnesium, especially where low cost and good finish are possible.

Examples: Four typical magnesium die castings of medium to large size are illustrated, two having replaced sand castings because of better appearance and economy, two replacing fabricated assemblies. The pieces are: washing machine support spider, movie projector sound head frame, vacuum cleaner control unit body and chain saw gas tank cover. Quantities per year range from 10,000 to 1,000,000 pieces for these typical castings.

Do-It-Yourself

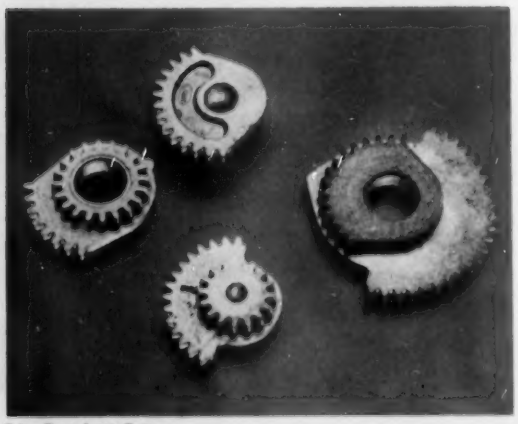


Paramount Die Casting Co.

Tomorrow: "Do It Yourself" is the catchword of thousands of energetic people who are doing many of the construction and repair jobs around home that they formerly hired professionals to do. It has become a booming hobby and an industry in itself. Supplies for this home craft field include large numbers of die castings. Large quantities, sales appeal, low cost and high quality all play a part.

Examples: Some of the die cast pieces will be as simple and unpretentious as a knob, dial, handle or lever, of which millions are needed in home workshop tools. Others will be large, complex and a challenge to the die caster. The 36½-inch gear rack with 279 accurately formed teeth and 1/16th inch calibrations on its entire length is die cast in zinc. Requirements for accuracy, flatness, surface quality and strength are high.

Tiny Die Castings



Grim Reproducer Corp.

Tomorrow: Tiny die castings have a big future. Screw machine parts with secondary operations, assembled stampings, small sand castings, formed wire and coined pieces can very frequently be made less expensively by die casting. Few assembled metal products are made that do not have small components that are or could readily be die cast.

Examples: A group of small gears for a time mechanism are die cast in zinc. They are more accurate and less costly than assembled stampings. Notice the combinations of pinion and segment gearing and cams.

Military Equipment

Tomorrow: Specialized military equipment of an increasingly complex character is the current trend. New weapons and new defense mechanisms call for metal components that have highest requirements on shape, dimension and service. Many of these are now die cast, the choice of alloy depending upon service conditions.

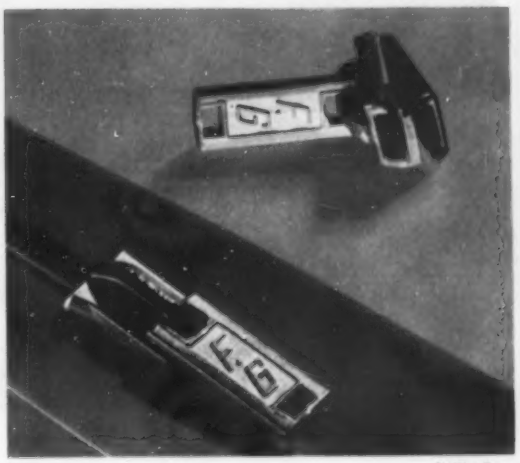
Example: An electronic wave guide die cast in aluminum is a new and interesting example of the use of high production methods for precise components. Internal rectangular channel is broached to a 45 rms microinch finish. The aluminum alloy is SAE 308.

Cincinnati Die Casting Co.

Special Products

Tomorrow: Specialized products that incorporate die castings, or depend on die castings as the only possible method of manufacture, include zippers. While other types of zippers exist, the development of machinery for casting zippers directly onto cloth tape, and the design of specialized types of zippers, are due to the die casting process.

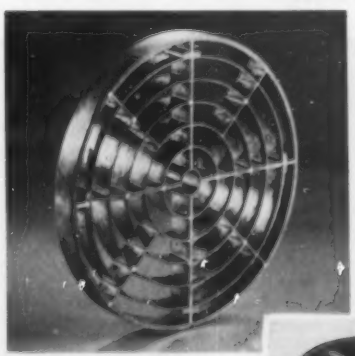
Example: Recently developed, special zipper sliders that fasten plastic material together use die cast zinc. The S-shape and complicated detail of these small sliders could not be made by any other process on a low cost basis.



Dollin Corp.

Tomorrow: Fabricated assemblies require too much time and labor for the economical production of large numbers of units. Die castings will find many uses where two or more pieces are now welded, because of greater strength and rigidity, as well as lower cost.

Example: Manufacturing costs were cut 33 percent on these precleaner sleeves die cast for Donaldson Co. of St. Paul, Minn. The die caster makes one die cast three sizes of sleeves by using replaceable cores in the die. The die casting, above, saves expensive fixtures and welding operations.



Twin City Die Castings Co.

Complicated Assemblies

DIE CASTING
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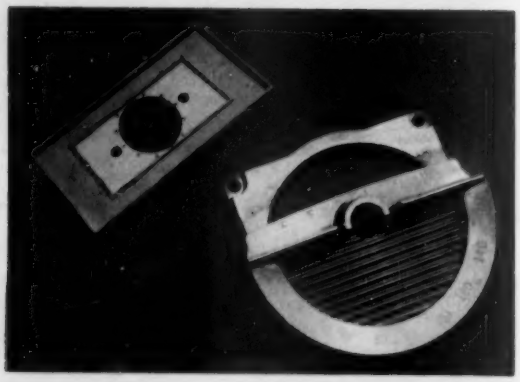
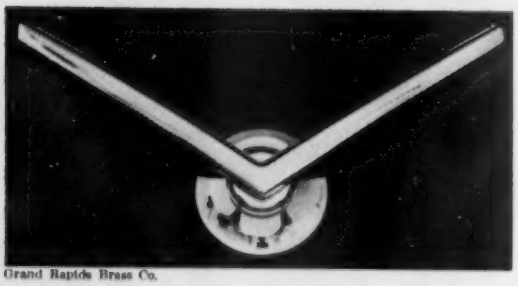
Decorative Trim





Grand Rapids Brass Co.

Tomorrow: Still leading the pack are decorative and trim die castings that are plated, principally cast in zinc and chromium plated. The unlimited freedom of shape for sales-minded product designers naturally indicates die castings for handles, escutcheons, bezels, nameplates, kickplates, housings, etc. More decorative die castings are produced each year than for any other type of service.

Examples: Three examples, all taken from current production for Philco, are shown. The two-tone paint job on the clock face for an electric stove, upper left, and the roman bronze paint on the radio front panel, illustrate organically coated die cast zinc; the two direction handle for a refrigerator has a smart combination that is increasingly popular . . . brass and chrome plating used together. Brass is more widely used today on die castings than ever before. The stove top instrument panel, below right, illustrates a large, flat surface that is cast with hardware surface and given an ultra-high quality chromium plating. This is a difficult casting, but one being done successfully to replace a steel stamping.

Super-Large Pieces

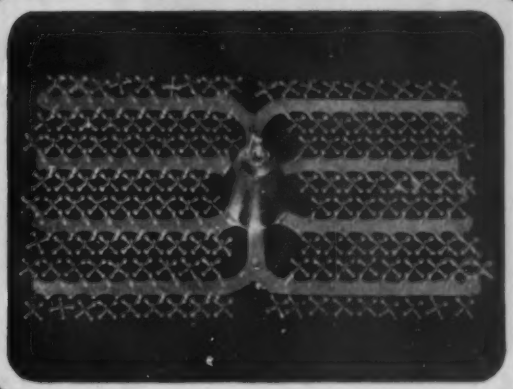
Doehler-Jarvis Div., National Lead Co.

Tomorrow: Size has been a limiting factor on die castings, but the die casting industry has gradually been pushing this limit to include pieces once thought impossible. Castings weighing 20 to 30 pounds and having large projected area are not impractical today, and predictions for tomorrow suggest complete engine blocks, large automotive panels, refrigerator doors, etc.

Example: Testing a large machine that is capable of die casting 75 pounds aluminum or 200 pounds zinc, engineers are turning out these large flanges for cable reels. Each casting in aluminum weighs about 40 pounds. See page 110.

telling the story of 'dag' dispersions

Die Sticking Prevented by Dry-Film Lubricants



Try **'dag'** Colloidal Graphite as a die lubricant. Here's why it's so good:

It's slick as a whistle, wholly unaffected by heat up to 750°F., and is easy to apply. 'dag' dispersions can be sprayed or painted on your dies, or put on by dipping.

Dies treated this way with 'dag' Colloidal Graphite take on a *dry lubricating film* that eliminates sticking, improves finish, and reduces carbon build-up in die impressions.

It lubricates ejector pins and plungers, too, so they won't stick or jam. Try a 'dag' dispersion and see! More details are yours by asking for Reprint DC and Bulletin No. 426-J.

Dispersions of molybdenum disulfide are available in various carriers.

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dag DISPERSIONS

Acheson Colloids Company, Port Huron, Mich.
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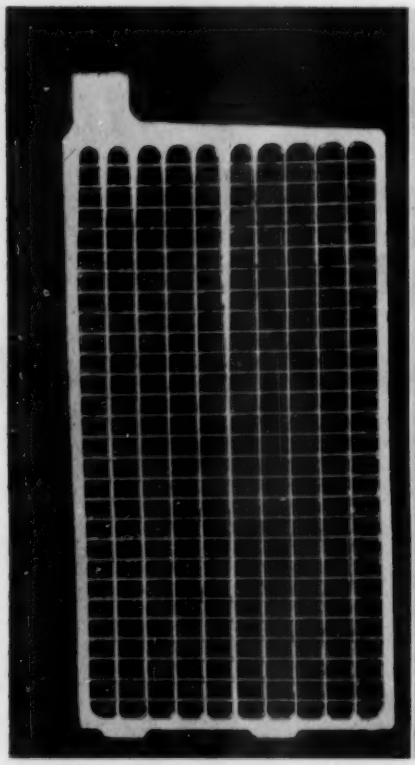
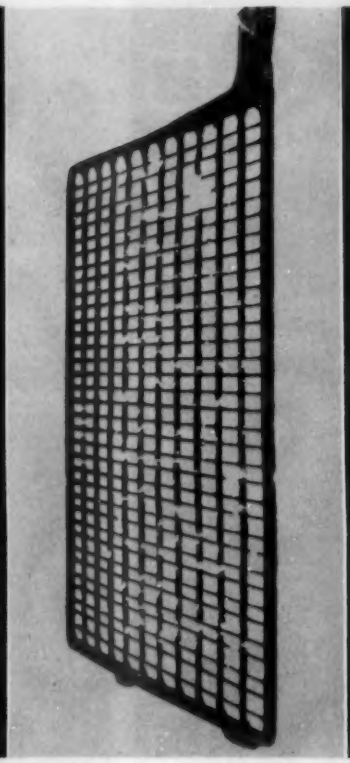
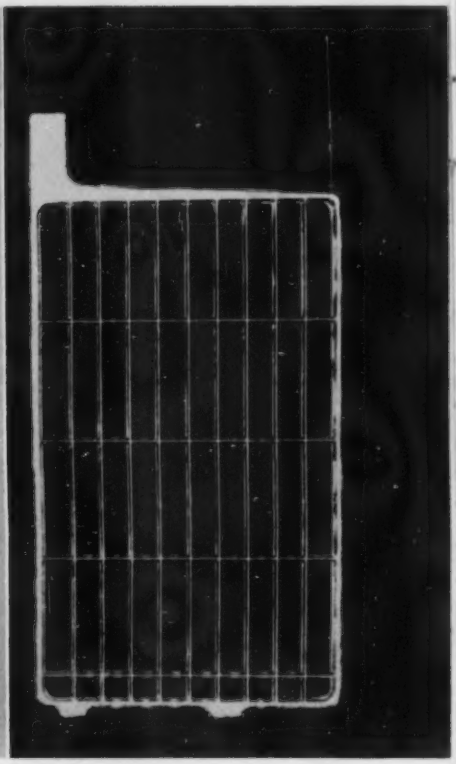
try resin-bonded dry graphite films for permanent lubrication



1. CONVENTIONAL DESIGN for lead alloy grid casting.



2. FLAWS which develop during battery life are evident.



3. Z GRID was first design change for improved castings.

THE lead-acid storage battery industry is interested in the art of permanent mold casting because it produces millions of parts annually by that process. Permanent molds are almost universally used by the industry for the casting of all lead and lead alloy battery components.

Molds used for battery part production are usually of plain or low thermal expansion cast iron. They are inexpensive, easy to machine, productive and have almost indefinite life. Depending upon part size, complexity and production volume required, the molds are either hand operated or set up for automatic mechanical production. Most investigation and engineering of the permanent mold process by the battery industry has been in the direction of increasing productivity of the equipment used.

Several years ago, the research laboratories of Gould-National Batteries, Inc. started an extensive study on permanent mold casting to determine what factors affected quality of the casting and how these could be controlled. This study was initiated after having established that microscopic flaws originating in use of conventional battery part casting techniques adversely affected battery life performance.

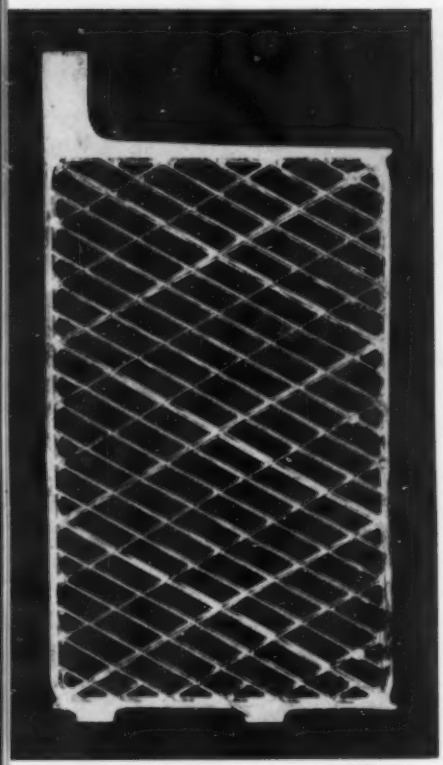
Before discussing casting flaws and the steps taken to control them, consider the battery component most sensitive to those flaws — the positive plate. Deterioration of this plate is most frequently responsible for end of useful battery service.

The positive plate consists, in part, of a lead alloy permanent mold casting called a grid. Such a casting of conventional design is shown in Figure *1*. The grid is filled with a mixture containing lead oxide and then after electrochemical conversion it becomes the positive plate of a battery.

The metal grid structure has two primary functions. The effective life of most batteries depends to a great extent upon how long the metal structure performs its primary function:

1 To provide a low resistance metallic path for the electrical current.

2 To contain and support the power-producing active material.



4. DIAMOND Z GRID design gives a superior metal structure.

Here's how

Battery Research Improved Lead Casting

By H. E. ZAHN, Ph.D.
Gould-National Batteries, Inc.

Because of the very corrosive conditions existing in an operating battery, only lead and its alloys are useful in its construction. The sulfuric acid solution and strong oxidizing conditions result in very rapid corrosion of other metals.

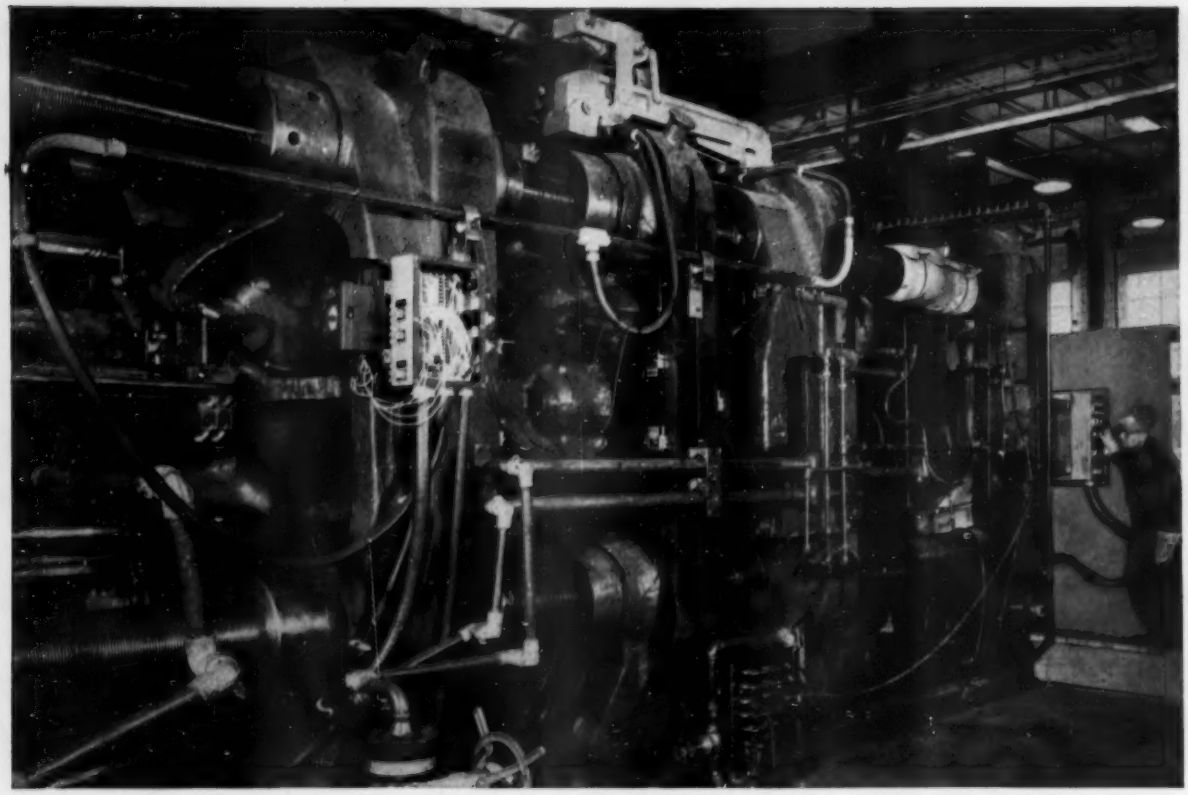
Prior to the initial work of this investigation, it was generally believed that uniform corrosion of the positive grid occurred during battery use until all metal was converted into a corrosion product of increased electrical resistance and low physical strength. Thus, battery failure was considered to be caused by lack of a metallic conducting path and loss of a strong framework to contain the active material.

However, careful examination of many positive plates taken from batteries used in a variety of applications, showed that considerable metallic structure remained after a useful period of service. The misleading characteristics of higher resistance and very low mechanical strength were due to numerous flaws or breaks in the structure which severed metallic connection between various plate areas. The breaks in the internal grid members reduced continuity of the original electrical paths and created severe structural weaknesses.

Study of plates at various stages of life and also controlled corrosion tests on bare grids established that flaws developed in the grid structure long before end of effective positive plate life was reached. Also, the number of such flaws increased with plate use. Uniform corrosion was not the primary cause for increase in electrical resistance and loss of strength. A test grid showing the form of flaws which develop during battery use is shown in Figure 2.

Battery life was limited by microscopic flaws which developed during casting of the grid. Complete or partial grid fractures were found. Other flaws resulted in accelerated corrosion penetration due to creation of cavities which would fill with voluminous corrosion product and force the metal open like a wedge. Such flaws resulted in visible metal flaws after the battery was put into service for some time. The degree to which these flaws originally reduced the designed cross-section determined the time

Continued on page 72



The leader, Doehler-Jarvis, takes another step forward...a Giant 72-inch die casting

In one tremendous thrust Doehler-Jarvis has broken through the "size barrier" that limited pressure-cast metal components to comparatively small dimensions and light weights.

The new 250-ton machine recently put into operation by Doehler-Jarvis can produce aluminum castings weighing up to 75 lbs. and measuring practically anything that will go between the tie-bars. Adapted to zinc, it can handle shots up to 200 lbs.

Ever since the invention of the first practical pressure die casting machine about a half century ago, many people have felt that "Doehler and die casting" were synonymous. It's common knowledge that just about every "first" in this fast, efficient process of forming metal parts has been credited to the Doehler organization.

This new machine is, in a way, the culmination of fifty years of effort to widen the horizon for die cast components. And the effort will not stop here.

Why don't you put Doehler-Jarvis to work on your metal-parts problem?

Castings are removed from machine by mechanical "arms." Cable reel flanges shown here weigh 41 lbs. as they come from the die, and 31 lbs. after gate and flash are removed.

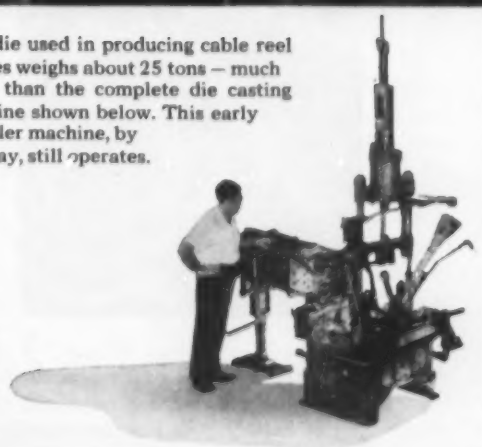
This huge machine "eats up" about a ton of aluminum per hour. An automatic ladle was developed to handle this large metal consumption.

Stride...with this machine

Doehler-Jarvis Division
of
National Lead Company
General Offices: Toledo 1, Ohio

*Reg. U.S. Pat. Off.

The die used in producing cable reel flanges weighs about 25 tons — much more than the complete die casting machine shown below. This early Doehler machine, by the way, still operates.



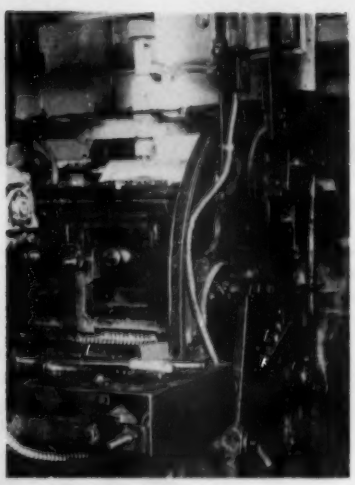
Casting Flaws Analyzed and Corrected

required for normal corrosion to sever the member.

Flaws which partially or completely fractured a casting showed up primarily as cracks. These were caused by metal solidification stresses, segregation effects or impacting of hot metal by the mechanical ejector used to release castings from the mold. Flaws which reduced the designed cross-section locally were micro porosity, dross inclusions, sub-surface gas entrapments and shrinks. All these flaws were microscopic in nature. To the naked eye — the castings would seem to be sound and measurements would show correct design dimensions. Absence of sound metal was hidden by the microscopic nature of the flaws or presence of a porous filler.

It is of interest to note that the character and influence of the flaws is such that alloy modification would not eliminate or reduce their effect upon battery performance.

Control over the various flaws was established by studying their causes and modifying the casting equipment and procedures. The first grids commercially produced which provided for uniform controlled loss of metal by corrosion were the "Z" grids shown in Figure 3. Flaw control and elimination was obtained on these castings by careful processing.



5. AUTOMATIC casting equipment for permanent mold casting of battery grids was developed to give sound castings.

All internal members of the "Z" grid were of equal cross-section to avoid intersection of varying masses of metal. This in turn eliminated micro-porosity at junctions and solidification cracking. Grids were cast by hand to permit complete drossing of ladles before filling the mold. This served to control the amount of dross introduced with poured metal. Low metal pouring temperature not only controlled the rate of dross formation on the metal surface but reduced the amount of dross formed by metal as it flowed through the mold. The molds were electrically heated and thermostated to regulate the thermal gradient in the mold. This insured uniform and controlled rate of metal solidification. The castings were gated only through the solid lug section which extends out from the grid. This regulated metal flow and prevented gas entrapment. Hand removal of castings prevented mechanical shock.

The "Z" grid has had a very satisfactory record over the past several years. Because the metal of that grid was sound and controlled uniform corrosion was obtained, the volume of metal required was greatly reduced over that in the conventional grid of Figure 1. The volume of space made available by reduction in metal permitted an increase in the amount of active material per plate which produced a longer lived, more efficient plate.

The success of the "Z" grid in service proved the value of controlled casting. The study of the permanent mold process was, however, not complete for two reasons:

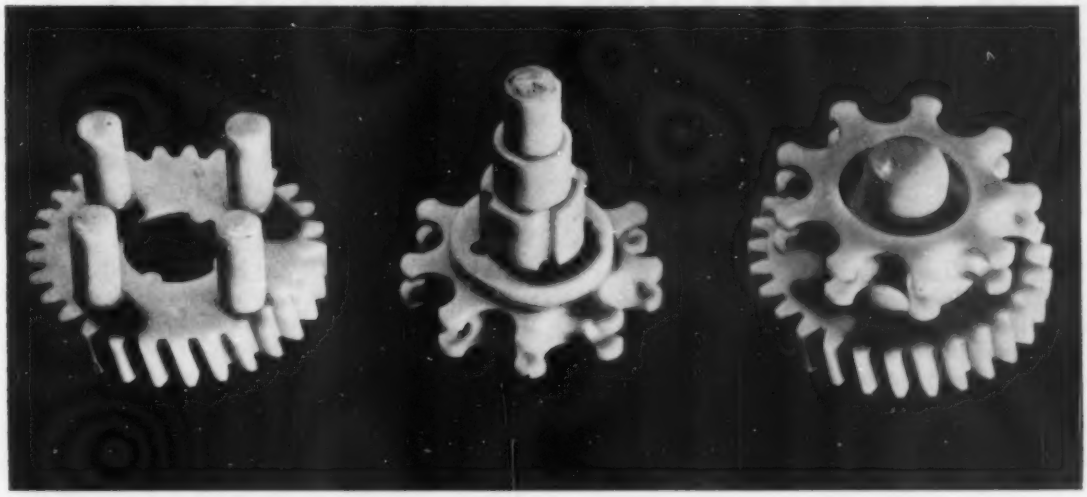
1. To obtain sound castings on the basis of available casting knowledge meant restricting the design engineer to certain metal cross-sections and metal distribution patterns.
2. The production department had to hold processing within very narrow limits to insure quality.

The design and production engineers both wanted more flexibility. To obtain the desired flexibility without any compromise of the new level of quality meant continued study of the casting process to determine its limits.

During the past year a new battery grid design known as the "diamond Z" has been introduced shown in Figure 4. This design became possible after establishing new characteristics for the permanent mold process. A high quality casting with such a geometric form would not have been possible without use of the newly developed casting information.

The number of members and their diagonal design are the most apparent modification of the original "Z" grid. The distribution and relationship of the members is in accord with the design engineer's desire for an improved grid structure. It is of interest to note that the in-

Continued on page 103



Investment Cast GEARS . . .

- Design Flexibility
- Lower Cost

INVESTMENT cast gearing offers many opportunities for the designer to achieve more complex shapes than can readily be produced by conventional machine shop practice. It also can frequently cut costs on gearing, especially when quantities are too small to permit full tooling for gear cutting or hobbing.

Two examples above cast by the K. W. Thompson Tool Company illustrate: 1.) a type of gear that costs less by investment casting, and 2.) a complex shape that is awkward to machine or assemble by other methods.

At the left is a segment gear that cost about a third less by investment casting than by previous manufacturing methods. At one time, this gear was cut from a complete gear and required several finishing operations. It was wasteful and expensive. Only machining needed on the cast gear is to bore the shaft hole and drill and tap for set screw.

The two-piece plastic pattern above, illustrates a combination helical gear and chain drive sprocket. Since the patterns for investment casting need to be made in a mold, the unit was divided into two separate pieces, a gear and a sprocket. The two pattern pieces are assembled by pressing the stem of one into a keyed hole in the other, as shown right above. Close tolerances are held and accurately shaped teeth are produced without any cleanup machining.

ADCI MEETING HIGHLIGHTS:

New Film—Product Standards—Hydraulic Fluids

THE 26th annual meeting of the American Die Casting Institute convenes at the Edgewater Beach Hotel in Chicago September 15-16. Those attending the two-day session will be in on some of the most important technical reports and panel discussions in the Institute's history.

They will also attend the world premiere of a new movie, the American Zinc Institute's dramatic film on the die casting process which has been in preparation for many months.

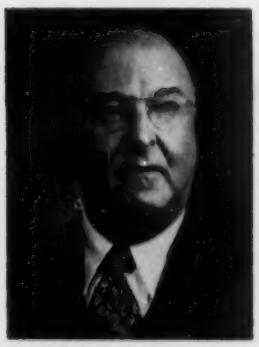
One of the most significant of the ADCI's long range projects is expected to show substantial results at this meeting. Progress made in the development of product standards is reported to be far enough along that several sets of standards may be ready for discussion and adoption.

The Institute's engineering committee and membership have devoted intensive study to the problem of standards and are nearing their goal. If adopted, these standards should be of great value to designers and buyers of die castings.

Also on the agenda is a panel discussion of non-flammable hydraulic fluids used in die casting machines. This reflects the continuing activity of the Institute's safety committee which, several years ago, prepared the first manual on safety in the die casting shop, and has been an important influence in improving safety practices within the industry.

Work done on two specific projects of vital interest to die casters . . . improved die materials and improved die lubricants . . . will be reported in detail at the meeting of the Die

ADCI Officers and Directors . . . 1953-1954


G. M. Rollason

W. J. During

D. Laine

T. J. Walker

G. Ralls

R. A. Luedtke

H. H. Weiss

C. G. Adams

Casting Research Foundation which meets on the second day of the sessions.

This is the second annual meeting of the Research Foundation which, last year, set up its objectives, met the research men who head the program, and outlined the steps by which the objectives might be accomplished.

Improved die materials, it is expected, will lead to longer die life when casting aluminum and magnesium and make possible not only the common die casting of brass, but possibly also the ferrous alloys.

Presentation of the annual Doehler Award for an outstanding contribution to the die casting industry during the past year will be a feature of the banquet which occurs on September 15. For complete program, see page 76.

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PROGRAM

26th Annual Meeting

AMERICAN DIE CASTING INSTITUTE

TUESDAY, SEPTEMBER 14, 1954

Meetings of Board of Directors
Meeting of Public Relations Committee

WEDNESDAY, SEPTEMBER 15, 1954

10:00 A.M. — Business Meeting for Members

Reports of Metallurgical and Safety Committees
Review of Certified Zinc Alloy Plan for Die Casting

12:30 P.M. — Precision Metal Molding Luncheon

2:00 P.M. — Business Meeting for Members

Report of Cost Accounting Committee on Simplified Cost Practices.
Report of Engineering Committee on Development of Product Standards.
Discussion of Use of Product Standards by the Industry.

6:30 P.M. — ADCI Cocktail Party

7:30 P.M. — Annual Banquet

Presentation of 1954 Annual Doehler Award for outstanding service to the die casting industry.
First Public Showing of New American Zinc Institute motion picture film "Die Casting — How Else Would You Make It!"

THURSDAY, SEPTEMBER 16, 1954

9:30 A.M. — Panel discussion on "The Use of Non-Flammable Hydraulic Fluids in Die Casting Machines".

W. C. Goodwine — Sales Manager, Plasticisers, Chemical Div., Celanese Corp. of America (Lindol)

W. H. Millett — Special Products Dept., Carbide & Carbon Chemical Co. (Hydrolube)
John S. Harris — Supervisor, Functional Fluid Sales, Monsanto Chemical Company (Pydraul)
D. C. Miner — Advertising Manager, E. F. Houghton & Co. (Houghto-Safe)

11:00 A.M. — Discussion of Film

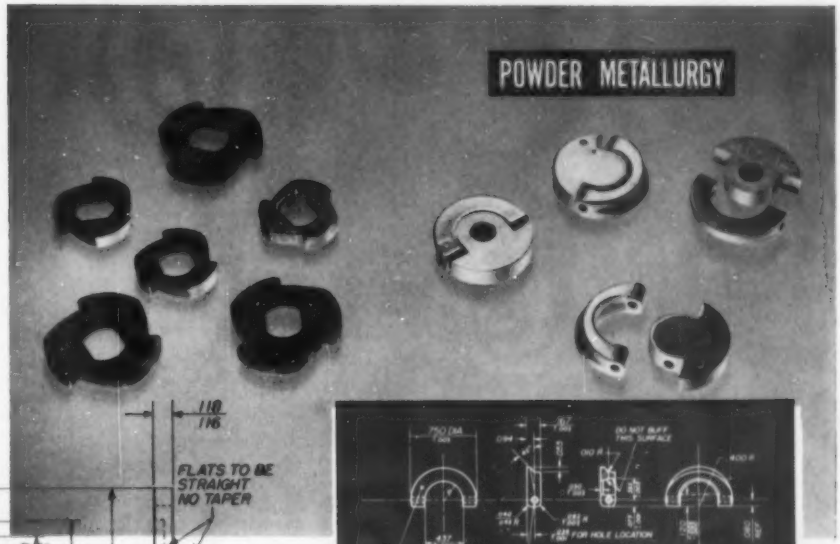
How to use the new motion picture film for increasing the market for die castings. A presentation of planned mechandising by the AZI-ADCI Joint Marketing Committee and the ADCI Public Relations Committee.

DIE CASTING RESEARCH FOUNDATION

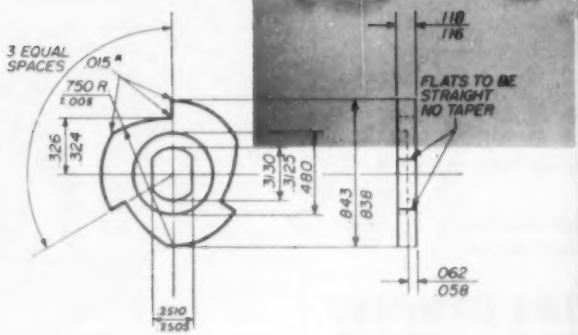
12:30 P.M. — Annual Luncheon

2:00 P.M. — Membership Meeting

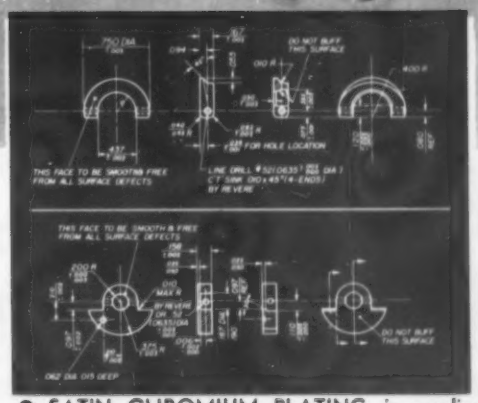
Review of Research Projects on Die Materials for High Melting Point Alloys at Battelle Memorial Institute.
Review of Research Project on Improved Lubricants at Battelle Memorial Institute.
1955 Program Outline.



1. POWDERED IRON ratchets and powdered brass latch components are used in cameras. Dimensions and surface finish are important.



2. RATCHETS were previously machined from bar. Problem of brinelling at the corners has now been eliminated.



3. SATIN CHROMIUM PLATING is applied over the powdered brass latch components without difficulty.

Can Powdered Metal Parts Be Surface Finished?

By A. E. SCHELLSCHMIDT, Assistant Chief Engineer
Revere Camera Co.

THE natural porosity of most powdered metal structural parts has generally precluded the use of any type of surface finishing, particularly where the finish has to be applied from an aqueous solution. That such surface finishing is both possible and practicable is demonstrated by three powdered metal parts that are now being used by the Revere Camera Co., Chicago, Ill. Two of these parts are pressed from brass powder and the third from iron powder.

In addition to being surface treated, the small winding ratchets shown in Figure 1 are unusual in that conversion to a powdered metal part not only showed a reduction in manufacturing costs, but also resulted in a part which, under the same conditions of service and without oil impregnation or special treatment, has superior wear resistance when compared with the previously machined ratchet.

Initially the ratchets were machined from bar stock, broached, chapmanized and hardened to 56-60 Rockwell C. Dimensionally the only very critical points are on the bore where tolerances of $\pm$ 0.00025 must be held as shown in the sketch, Figure 2. The parts made from bar stock were satisfactory in all respects except that the corners tended to brinell, resulting in seizing.

By changing to a powdered iron part it is possible to produce the ratchet to the same dimensional accuracy as before. By

Continued next page

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Die Castings by MILWAUKEE

...for Extra Values at No Extra Cost!

A pioneer in its field, Milwaukee offers you the experience and knowledge gained in helping others for more than 40 years, to realize the full benefits of the die casting process. In its modern plant, it offers you the most advanced facilities for the production of zinc and aluminum die castings. These extra values which cost you no more, can help you build extra values into your product, too.

We operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.

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There is the RIGHT Ring for every purpose. Auto-Diesel Engineers have developed a Two Piece Segment Ring especially for hot chamber casting machines. They are precision made to give you better service. Casting sizes available: — 1½", 2", 2¼", 2½", 2⅝", 2¾", 2⅞", 3", 3½", 3¾", 3⅞", 4" by ⅞". Write today for prices. We can make prompt delivery.

AUTO-DIESEL PLUNGER RINGS have lasted . . . OVER 122 Days

Auto-Diesel hardened steel Plunger Rings have set a new and much higher standard of performance. In actual use these rings have lasted over 122 days — they were immersed in molten zinc over 800 hours. This was not unusual — the useful life is measured by MONTHS — not by the HOUR. They were especially designed for die casting machines or casting zinc parts. They are made of hardened steel, dieloy cast iron or cast iron. They will enable you to reduce costly down time to the minimum. It will pay to write for further information.

Write for Details

THE AUTO-DIESEL PISTON RING CO.

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Powdered Metal Parts With A Finish — Cont.

case carburizing and hardening to 77-82 Rockwell N, the brinelling at the corners has been completely eliminated.

Since the cameras on which the ratchet is used go into all sorts of atmospheres and climates, good corrosion resistance is required. On the powdered iron parts, resistance to a 24 hour salt spray test is secured by phosphate treatment after hardening. The phosphate process used is standard in every respect and by proper washing and drying, no exudation of treating chemicals occurs.

The change to a powdered iron part made by Chicago Powdered Metal Products Co. has resulted in not only a better ratchet from an operational standpoint, but manufacturing costs have been sharply reduced.

The other powdered metal parts used by Revere Camera Co., other than a number of self-lubricating bushings, are the two latch parts also shown in Figure 1. These two pieces are pressed from brass powder and were originally designed to be produced from metal powders. Dimension-wise, both of these pieces fall easily within normal powder metallurgical operating practice.

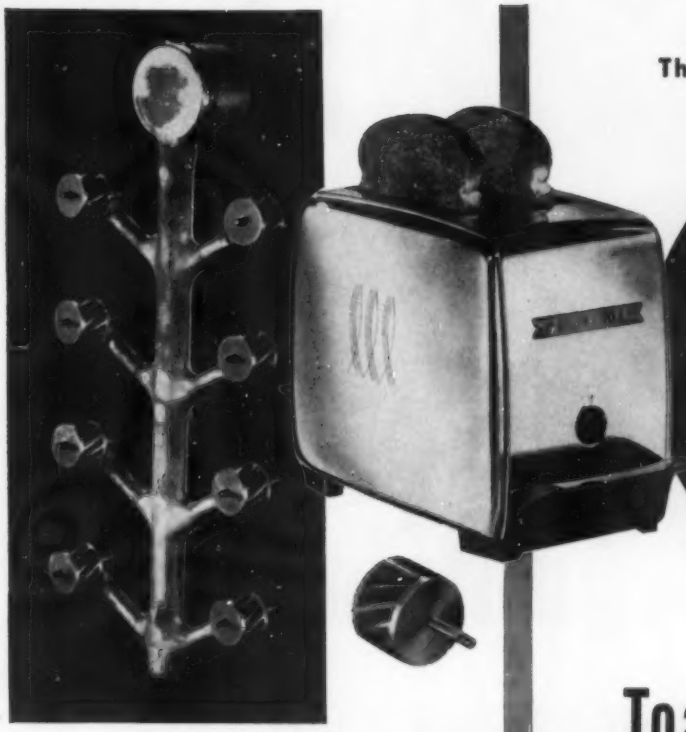
Purchase specifications for these two parts call for a material that is suitable for chromium plating. This requirement has been easily met by the fabricator.

As received from the fabricator the latch parts are complete except for drilling the one pivot hole noted on the drawing, Figure 3.

A satin chromium plated finish is required on this part. No special methods have to be used other than barrel plating does not seem satisfactory and the parts must be racked and plated in still tanks. The brass parts as pressed and sintered need no polishing and buffing prior to plating but must, of course, be buffed after plating to secure the desired satin finish.

The toaster you never need touch

depends on an electric motor ...so



Over 600 of these rotor gates are die cast each day, thus producing over 4800 of the finely detailed rotors shown above in two-thirds actual size.

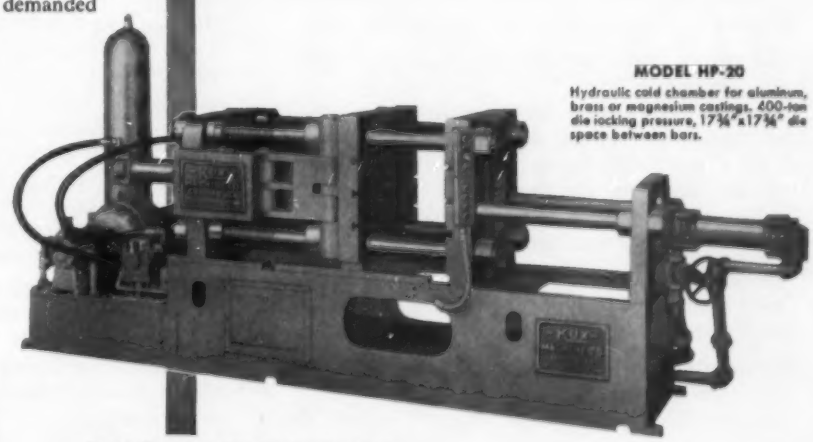
Toastmaster chose Kux die casting machines

to make the heart of the motor... a tiny aluminum rotor

The Toastmaster Products Division of McGraw Electric Company has a recipe for perfect toast with its new Super Deluxe Toaster. Merely place the bread in the toaster . . . it lowers the bread, starts it toasting and serves it up fast . . . all by itself!

It's an amazing automaton, thanks to the tiny aluminum die cast rotor that is the heart of the small powerful motor that serves as the elevator for the bread. A KUX Model HP-20 die casting machine was chosen to produce the rotors because of its long record of dependable service in turning out castings of fine detail and quality. As Toastmaster says, "the rotors meet the high standards demanded of every Toastmaster toaster part."

KUX produces a full range of modern die casting machines that require only the touch of a push button to put them automatically through a complete casting cycle that consistently turns out quality castings at high production speeds. Write for our detailed illustrated catalog.



MODEL HP-20
Hydraulic cold chamber for aluminum, brass or magnesium castings. 400-ton die locking pressure, 17¾"x17¾" die space between bars.

KUX MACHINE CO.
6725 Ridge Avenue, Chicago 26, Illinois

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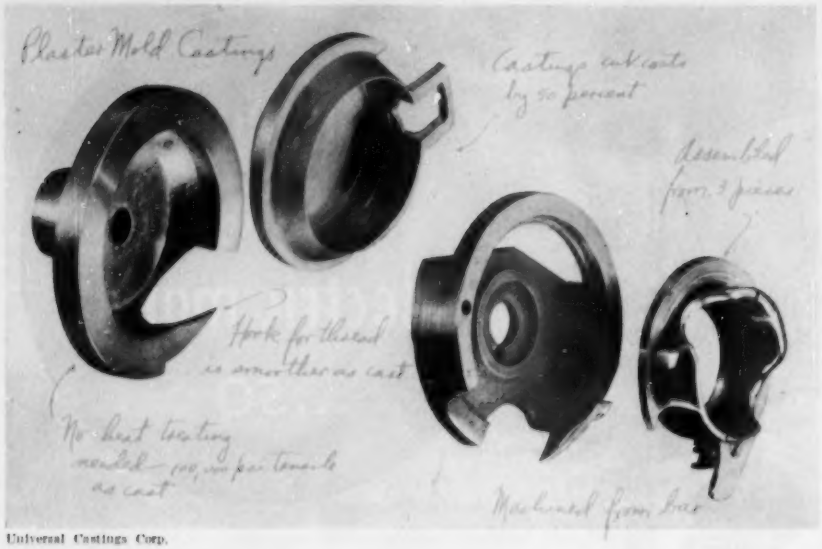
PLASTER MOLD CASTINGS


Plaster Mold Castings
Castings cut costs by 50 percent
Assembled from 3 pieces
Hook for thread is smoother as cast
No heat treating needed—100,000 psi tensile as cast
Machined from bar

Universal Castings Corp.

We asked the designer why he had chosen plaster mold castings to replace machined cold rolled steel for these sewing machine parts. Below are his answers.

Manganese Bronze Plaster Mold Castings Give Improved Performance

Question: *Name and identification of parts by function.*
Answer: The two castings illustrated are used in a home sewing machine. The larger casting with the sharp pointed projection is a hook part which picks up the thread loop from the needle and forms the stitch. The smaller piece with the rectangular projection is the stationary base which sets inside the hook casting and contains the bobbin of thread.

Question: *Of what material were they formerly made?*
Answer: The two castings were formerly machined from cold rolled steel bar stock.

Question: *Were any special machining operations involved?*
Answer: The manufacture of the two parts by machining from bar stock required extensive special machining operations involving turning, milling, drilling, shaping, filing, grinding and polishing. The base part required assembly of three fabricated machine pieces.

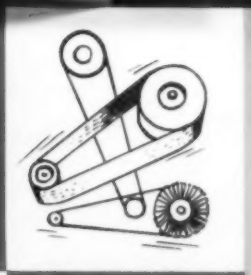
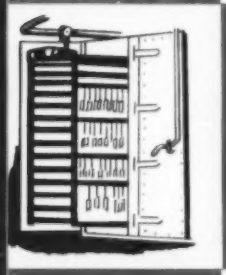
Question: *What tolerances are required?*
Answer: ± .005 inch per inch except on surfaces which are machined to ± .001.

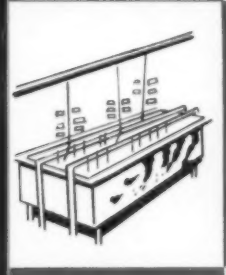
Question: *Was it necessary to make any changes in design of the parts?*
Answer: Both pieces were changed in their design to permit casting them satisfactorily. The design changes did not in any manner interfere with the functioning of the machine or require changes in any of the mating parts of the machine.

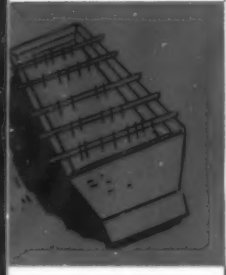
Question: *Was performance of the machine improved by the use of castings?*
Answer: The cast surfaces reduced considerably the tearing of the thread which must slide over them. Formerly tool marks would tend to snag the thread.

Question: *Are physical properties important?*
Answer: It is necessary to have high strength in the hook section because it is subjected to some impact. It was necessary to heat treat machined parts. Heat treatment is unnecessary in the manganese bronze cast parts which have considerably higher physical strength than machined steel parts in the heat treated stage. Manganese bronze castings have 100,000 psi minimum tensile strength. Failures were encountered in the machined parts on occasion because of insufficient impact strength.

Question: *How much was saved?*
Answer: By using cast manganese bronze parts the assembled unit showed a saving of 50%. Numerous machining operations were eliminated which also released machine equipment for other work.





PMM

Finishing Section

Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

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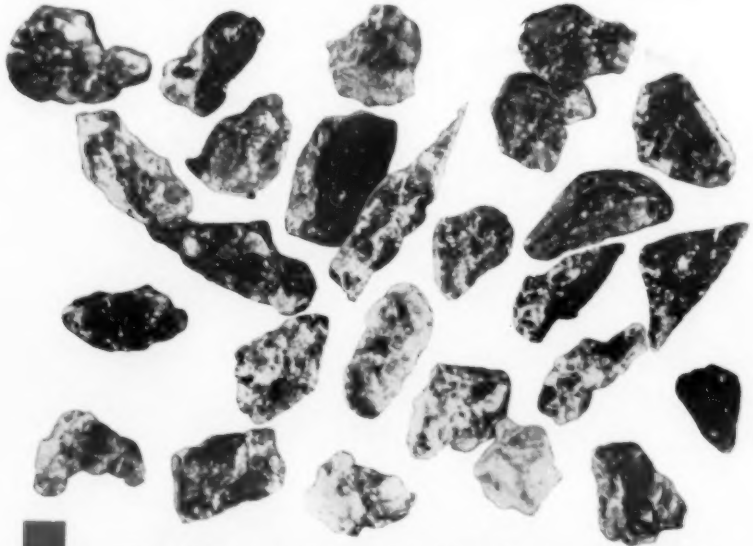

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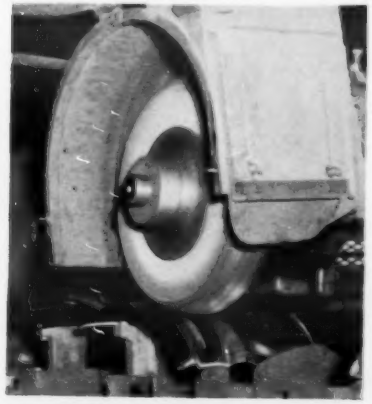

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THESE CASTINGS have been phosphate coated prior to painting. The nameplate was painted with a pure, tinted, clear silicone enamel containing a medium fine bronze pigment. The handles were painted with a modified silicone white enamel. Castings courtesy of Perfection Stove Co.

Silicone Enamels: New Coatings For Zinc Base Die Castings

BY LYNN SPRAGUE
Research Metallurgist,
Pesco Products Div. of
Borg Warner Corp.

DUE to the great strides made by the paint industry in the post-war era in the development of silicone and modified silicone enamels, the use of these enamels has become a substantial production item in many shops. With the advent of a new material such as this, many problems are encountered which are, at times, exceedingly difficult to solve due to the limited practical experience available. As more information is made public and better formulations are developed, a much wider use of these enamels is anticipated.

Silicone enamels have gained a good response from the finishing industry for several reasons. They have exceptionally high heat resistance, the degree of which depends on the type of pigments and the amount of silicone resins embodied in the enamel. A properly prepared silicone finish has high hardness, excellent abrasion resistance and good adhesion. The resistance to water, alkaline solutions, soaps, and detergents is superior to the conventional synthetic enamels, a factor which has encouraged their adoption by the appliance industries.

How To Get the Best Results From Silicone Enamels ——→

How To Apply Silicone Enamels

. . . surface preparation, painting, baking

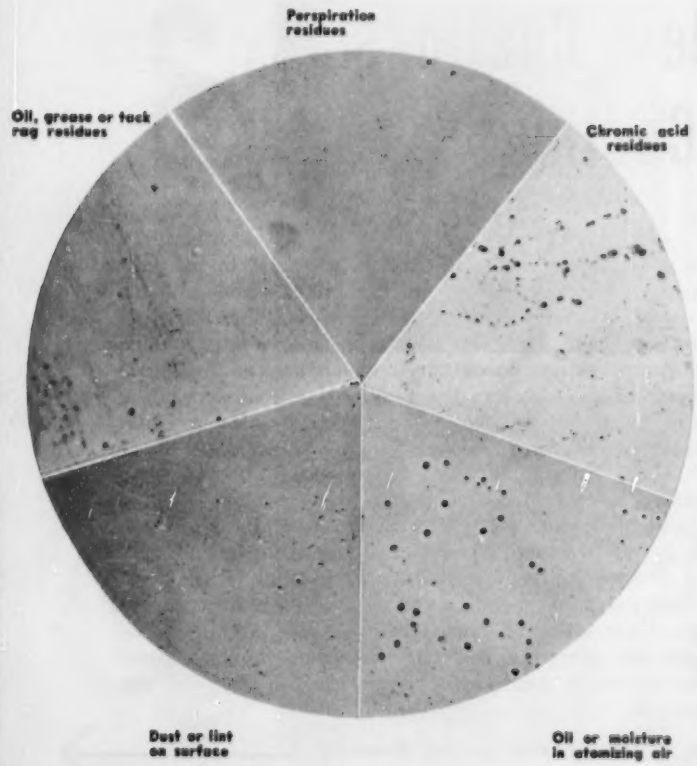
Surface Preparation: The surface preparation of zinc die castings prior to the application of a silicone finish must be performed with greater care than is ordinarily exercised with conventional baking enamels due to the greater sensitivity of silicone base enamels to foreign matter such as traces of oil, grease, moisture, mold lubricants, etc.

The initial step in cleaning is the removal of the bulk of the soil, oil, and dirt by the use of a pre-cleaner. This can be readily done by vapor degreasing with a chlorinated solvent, emulsion cleaning by use of emulsifiable solvents, or cleaning in di-phase type cleaners. The latter is more effective in a spray installation than in soak tanks. Alkaline soak cleaners must be avoided due to the attack on the zinc by the strong alkaline solutions.

The above cleaning cycles are effective in the removal of most of the objectionable oils. However, if the die castings are contaminated with graphite or other equally difficult to remove inert materials, it may be necessary to resort to more drastic cleaning procedures. For small

Common Defects

. . . and how to overcome them


Perspiration residues
Oil, grease or tack rag residues
Chromic acid residues
Dust or lint on surface
Oil or moisture in atomizing air

1. *Flatting:* Flatting is a loss of gloss encountered after baking. It is generally accompanied by a very fine wrinkling of the paint film. The chief cause of this defect is the presence of foreign vapors in the baking oven. Another cause is over-baking with temperatures in excess of those recommended. The former fault is corrected by completely purging the oven before baking more work. The source of the foreign vapors should be traced so that a re-occurrence may be prevented. Degreasing vapors are the major source of the objectionable vapors. The latter cause of flatting (over-baking) naturally can be corrected by following the manufacturer's baking instructions. In most cases, work can be left in the oven for as long as two hours provided the temperature is not in excess of 475 F. This is an added advantage of silicone finishes in the event of an equipment breakdown during baking.

2. *Oil Spots:* It has been mentioned earlier that the atomizing air must be kept free from oil and moisture. If oil is present in the air, the result is many fine craters in the work which in many cases will penetrate the paint film completely. The craters are invariably round and are most evident in the high gloss silicones. The most common size found are $\frac{1}{16}$ to $\frac{1}{8}$" diameters.

Several steps may be necessary to remedy this fault. The initial step is to clean all air filters with a solvent to remove the oil which will coat the baffles in the filter. The air regulator for the atomizing air must be cleaned as the regulator acts as a trap.

lots, hand wiping with solvents such as naphtha or xylol may be most economical.

For production runs, a short immersion in an anodic electro-cleaner is exceedingly effective. Care should be taken to hold the immersion to a minimum so that the attack on the base metal is minimized. The anodic cleaning should be followed by a warm water rinse and an acid dip.

The acid dip serves two functions. It neutralizes the alkaline residues and removes the smut formed in anodic cleaning. The acid rinse is generally very mild such as ½-1% sulfuric, citric, or hydrochloric acid. A very thorough cold water rinse should follow the acid dip.

The next step in the surface preparation is the formation of a chemically inert surface layer. This can be done by several means. One method is the formation of a chromate conversion coating by an immersion treatment. Many proprietary compounds are available for this treatment which vary in operational procedures.

In general, they are of a chromic acid base, operated at temperatures varying from room temperature to 140 F., have immersion times of 30 seconds to 4 minutes, and result in a smooth adherent irridescent layer. The manufacturer's instructions should be followed, due to the variations in composition.

Another method is the formation of an insoluble phosphate coating on the die cast surface. The phosphate coating can be applied by spray or soak methods. Both methods are very effective and the choice is dependent on the type of part to be treated, the size of the production runs, and the tolerable expense to be allowed for installation. The phosphate coating is applied in the following steps:

1. *Phosphate dip or spray:* This is generally used at temperatures of 130 - 160 F. in stainless steel equipment. Immersion times vary from 30 seconds to 3 minutes.
2. *Cold water rinse:*
3. *Chromic acid rinse:* This is a very weak rinse of chromic acid (approximately ½-1% concentration) with a very short immersion time (5-30 seconds) and is used to "set" the phosphate coating.

Continued next page

The air hoses must be cleaned with clean solvent.

On a larger scale and to prevent major difficulties, the air compressor should be checked to determine if large amounts of oil are being passed by the rings on the piston. Wherever possible, air lines which lead away from the main air line should be pitched upward so that the main air line acts as a collector for the condensed moisture and air. The main line should then be fitted with bleed lines to allow the removal of the condensate. During relief periods during the working day, traps and bleed lines should be opened as much as possible.

3. *Grease and Oil on the Work:* This defect is easily recognized because the paint will draw away from the contaminated areas leaving the work bare during baking. A small amount of oil or grease may contaminate a large area due to the flowing of the oil at the high baking temperatures. The adhesion in adjacent areas will be very poor.

The cure, of course, is the elimination of the oil or grease which may be due to improper cleaning, careless handling, oil dripping from equipment, or oil and grease encountered in storage prior to painting. This is another indication of the care necessary in handling work which is to be finished with silicone enamels.

4. *Tack Rag Marks:* On certain items where an exceptionally fine finish is necessary, all lint may be removed by wiping with a tack rag. If a workman is careless and allows his rag to become contaminated with solvent, the rag will leave traces of the coating varnish on the work. The paint will react to the tack-rag marks in the same manner as it would to grease and oil.

5. *Finger prints:* Finger prints may leave a residue of salts due to perspiration or a film of oil and dirt from dirty hands. The residues are preserved intact throughout the painting and baking and show up as areas of low gloss on the finished surface in which the finger prints are perfect images. The easiest way to eliminate the defect is handle the work with clean gloves and hands.

6. *Discoloration:* Discoloration is seldom encountered in the darker enamels. In lighter shades, it is due to excessively high temperatures encountered in baking or baking in an oven contaminated with Japan fumes or with the fumes of other asphaltum base, paints. The latter is cured by purging the oven while the former may require that the oven controls and indicators be checked for their accuracy in determining the maximum temperature in the oven.

7. *Dry Dust on Finished Surface:* This is a matter of spraying technique and can be corrected by adjusting the spray gun to increase the paint supply and cut the atomizing air at the gun.

How To Apply Silicone Enamels — Cont.

4. *Warm or hot water rinse:* The temperature is not critical in this stage. It is necessary to remove the acid and heat the work to facilitate drying.
5. *Dry*

Phosphate coatings result in crystalline gray deposits which promote adhesion mechanically. They have an additional advantage of having self-cleansing properties when used in soak installations.

The necessity for the chemically inert surface is due to the activity of the base metal which may cause a reaction between the base metal and the reactive components of the paint finish. In certain cases, good adhesion is achieved initially but the adhesion deteriorates rapidly. This is undoubtedly due to the penetration of moisture through the paint film which would allow decomposition products such as organic acids or zinc formate to form at the metal paint interface.

These reactions are greatly retarded or virtually eliminated by the barrier layer of chemically inert phosphates or chromates. Therefore, the deterioration of the adhesion of the paint film is also greatly retarded.

Another factor to be considered with respect to surface preparation is the fact that silicone paints have poor hiding power with respect to surface imperfections. Coarse grinding marks, deep scratches and gouges from careless handling, and surface defects resulting from mold imperfections will show through the finished paint film. Grinding of parting lines and of surface imperfections should be done with 120 grit or finer. If it is necessary to use coarser grit due to deep imperfections, it may be necessary to finish grind with finer abrasive.

Good results have been obtained in the elimination of grinding marks by the use of motorized wire wheels with 0.011 - 0.014 inch stainless steel bristles which tend to flow the metal and thus obscure the surface defects. All surface finishing must be done prior to final cleaning and the application of the conversion or phosphate coating.

With certain conveyorized installations, it may be most convenient to run the work through a vapor degreaser immediately prior to painting. The added degreasing operation has no detrimental effect on either the phosphate or conversion type coating. It may be advantageous to include this step which will tend to remove oil or grease encountered in storage or in transit and any light dust or foreign matter which has settled on the work.

Application of Silicone Enamel: The spraying of silicone paints requires the same general precautions observed in the spray-

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ing of any paint or enamel. If pressurized tanks are used, a tank pressure of 9 to 15 psi. is generally used. Air driven agitators are recommended but are not a necessity. Atomizing pressure of 45 to 60 psi are used.

Care must be taken to insure that the air supply is free from all traces of moisture and oil. In modern paint shops, refrigeration is used to remove moisture. However, in old installations, refrigeration is not provided for. It is therefore necessary to install sufficient filters to remove the moisture present after compression of the air.

A new filter recently developed involves the passage of all air through a spun fiber glass compact which is very effective in the adsorption of moisture. The compact is easily and economically replaced. Filters must be cleaned regularly. The silicone and modified silicones are generally furnished by the manufacturer to be sprayed full body with no thinning required. The wet film as sprayed has excellent flowing characteristics so that orange peel is easily avoided. It may be helpful in many spray jobs to apply a mist coat to be followed by a wet coat approximately 15-30 seconds later. This is very helpful in preventing sags or runs. The maximum dry film that can be applied in one coat is 0.005 - 0.007".

Fluid hoses used for silicone paints should not be used for other paints due to the high solvency of silicones which will loosen any dried paint particles in the base and float them onto the work.

Baking: The normal baking cycle for silicone enamels is 425 - 475 F for 10-30 minutes. The minimum temperature for curing is 390 F.

It should be remembered that these temperatures will act as an aging treatment for zinc die castings and a loss of physical properties cannot be avoided.

A pre-bake prior to the application of the enamel and after the phosphate treatment has been applied, has been found to promote better adhesion and prevents the formation of fine blisters in the paint film. This is evidently due to the formation of an adherent oxide film and the evolution of gases which are allowed to escape from the castings more freely than if they were forced to diffuse through a paint film. The pre-bake should be of the same cycle as the baking schedule recommended for the formulation used.

If other paints are used in the baking equipment, the ovens should be purged prior to baking silicones. This is especially necessary when light colored silicones are used and where there is a possibility that Japan or other asphaltum base paints have contaminated the oven atmosphere.

If degreasing vapors such as trichloroethylene have entered the baking ovens, the ovens should be purged immediately. If this is not done, all work passing through the oven will become flat. It should be noted that degreasing vapors are heavier than air and crawl along the floor. If the air intake of the oven is at floor level, the danger of poisoning the oven atmosphere is fairly common.

Salvaging of Rejects: A problem which invariably faces production personnel is the re-working of re-

Continued on next page

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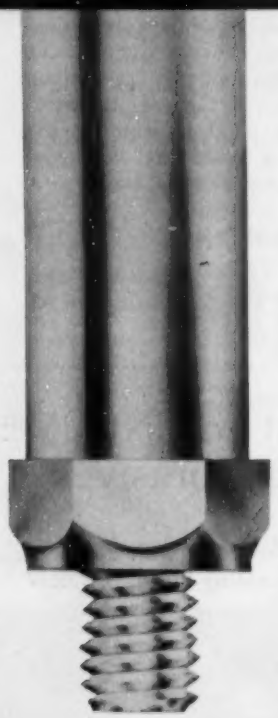

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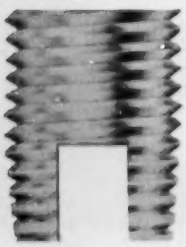

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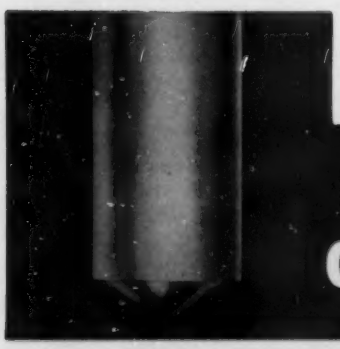

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Silicone Enamels — Cont.

jected work. The use of silicones requires more care in handling than in the case of conventional enamels and lacquers.

The initial stage in re-working is the sanding of the blemishes to a reasonably smooth surface. If the defect is not easily sanded, it may be necessary to strip the paint film from the part. For sanding, 280 grit wet emery paper has been found to give an excellent finish when used dry or with a solvent such as naphtha. A new development on the market is an abrasive coated mesh which does not clog as rapidly as the normal emery paper.

The dust remaining from the sanding operation can be removed by wiping with a tack rag. Care should be taken to avoid contact of the tack rag with any solvent. On certain items, it may be permissible to remove the dust with a dry air stream.

If the parts to be recoated become oily or greasy, it will be necessary to wipe the parts with cheesecloth or soft rags dampened with xylol or naphtha. An alternate method would be to dip the parts for 5 to 20 seconds in cold, clean naphtha and drying with air. Degreasing solvents should not be used for dipping or wiping. Above all, vapor degreasing cannot be used as it will wrinkle and loosen the paint film.

If the work has been rejected due to low gloss, it may be resprayed without sanding. When the rejected work is due to a wrinkling of the paint film because of vapor contamination of the oven, the necessity for sanding must be based on the degree of wrinkling present. When only fine wrinkling is present, a second coat of paint will cover it but when coarse wrinkles are present, the affected area must be sanded.

An important item in salvaging rejects is the re-coatability of the formulation of enamel being used. Some formulations

have sacrificed re-coatability in the interests of promoting higher hardness, mar resistance, and gloss. This is accomplished by the addition of waxes and other substance which float to the surface of the paint film. These substances interfere with the adhesion of subsequent paint films. An excellent test for re-coatability is performed by pressing a strip of masking tape on the re-coated surface and allowing it to set for 30 minutes. The tape is removed by pulling it rapidly. If traces of paint are removed by the tape, re-coatability is poor. The paint formulator can rectify this difficulty by changing the original formulation.

When it is necessary to strip the work, alkaline paint strippers must be avoided for two reasons. A long immersion time is necessary to allow the stripper to digest the paint film. The alkaline strippers will show a vigorous attack on the zinc base die castings. Cold solvent strippers containing such additional agents as creosolic acid or ammonia are very effective but require certain precautions. Immersion times should be kept to a minimum as there is a slow attack of the base metal. The paint film which comes off in sheets must be removed from the stripper tank daily to prolong the life of the stripper which is relatively expensive. The normal cost of the strippers is $2.50 to $3.25 per gallon. When the stripper becomes loaded with digested varnishes and resins, it becomes difficult to rinse from the stripped parts. It is then necessary to repeat the entire cleaning cycle outlined earlier.

Summary: Silicone base enamels have excellent physical characteristics and are becoming of great importance in the industrial field. They do, however, require more careful handling and processing than conventional enamels. This article was not meant to frighten potential users away from them but rather to educate them as to the care necessary to obtain a good economical finish. The difficulties encountered with these enamels are not great ones. A little care, a little common sense, and a little education will go a long way in overcoming these difficulties.

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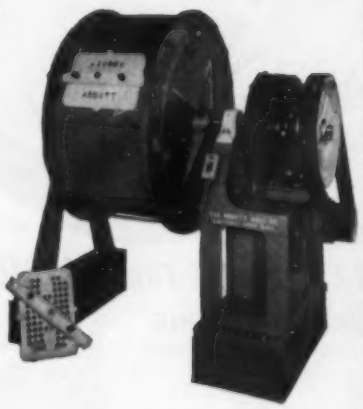

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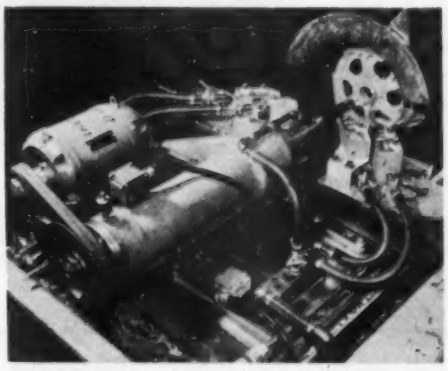
finishes holes on a die cast torque converter housing

BECAUSE die castings are accurate and uniform as cast, they often simplify and minimize the machining operations that must be performed on them. However, it is possible to increase the speed and improve the finish produced by these operations by selecting high efficiency setups.

One example of this is a two-operation job to finish large and small diameters on die cast aluminum torque converter housings. A pair of Gisholt Simplimatic automatic lathes do the job.

First Operation Uses Speeder-Equipped Boring Bar

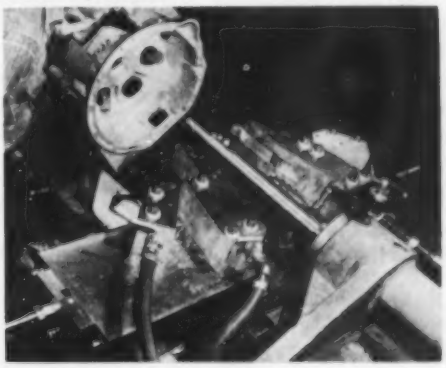


The part comes to the machine for the first operation with the cylinder block joint face rough machined for locating purposes. The workpiece is clamped on the large flange face by means of an air-operated drawback fixture with location and drive from dowel holes in the flange. Tools mounted on the front and rear slides rough and finish face.

While the front and rear slides are working, tools on a special speeder-equipped, piloted boring bar mounted on the center slide bore and chamfer.

Spindle speed is 500 rpm, and with the speeder operating, boring speed is increased to 800 rpm to give uniform finish on the machined surfaces. Time for this operation is less than one minute ftf.

Second Operation Has Same Machine Operator



Again, for the second operation, a special air-operated drawback fixture is used, locating and driving from dowel holes in the large flange. The part is held against the large flange face by clamping through three cored holes. A vibration dampener between the fixture and large flange face gives a quieter operation and prevents chatter.

On this second setup, the Simplimatic has an extended bed and the table operating position is 12 inches back of standard. Also, the fixture which holds the work is specially balanced to operate at 500 rpm spindle speed.

In this operation, as in the first, the front and rear slides finish face while tools on the special, speeder-equipped, piloted boring bar counterbore and chamfer.

One operator easily handles both machines, and since the time on the second operation is also less than one minute ftf, hourly production totals 48 or more completed housings at 80 percent efficiency.

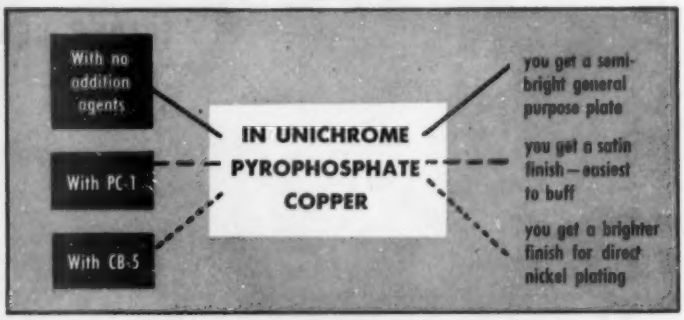
UNICHROME

News about

COATINGS for METALS

Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

Copper Bath Now Gives Three Finishes


With no addition agents
With PC-1
With CB-5
IN UNICHROME PYROPHOSPHATE COPPER
you get a semi-bright general purpose plate
you get a satin finish—easiest to buff
you get a brighter finish for direct nickel plating

New addition agents for Unichrome Pyrophosphate Copper Plating Solution add extra benefits

AMAZING new versatility has been introduced into the Unichrome Pyrophosphate Copper Process by development of two new addition agents. Now, in addition to the time-tested semi-bright deposit, a still brighter or a satin finish can also be obtained. Platers can now choose a deposit that best fits the work to be plated, and thereby cut costs.

BUFFABILITY INCREASED

One of the new addition agents, Unichrome Compound PC-1, increases plating speed as much as 15 to 20%. The satin deposit it produces hides polishing marks on steel. This dense deposit "flows" under the buffing wheel at lighter pressure. Buffing this copper suffices in many cases, eliminating any need to do the harder buffing on subsequent plates.

BUFFING AVOIDED

Unichrome Compound CB-5, the other agent, serves to brighten the deposit. Producing a more uniform plate overall, it can generally eliminate need for copper buffing prior to plating with bright nickel. Even low current density recesses get increased brightness.

Increased plating speed has also been obtained in installations using this addition agent.

MORE COST CUTTING FEATURES

Whether used with either of the new agents, or simply used alone, the Unichrome Pyrophosphate Copper Process offers certain service-proved advantages that reduce plant operating costs.

As a cyanide-free bath, for example, it minimizes cyanide disposal expenses — which include *materials* to treat the wastes; also the cost of waste-treating *equipment*, the *space* it occupies, and the *labor* to operate and maintain it.

Other features insure simplified operation. It maintains its initial wide current density range. It permits simple, more efficient air agitation. It covers well without difficulty, and it is unusually easy to control. Send for new Bulletin CU-3 which gives more details.

HERE'S ECONOMY IN TEMPERATURE-CONTROL COILS

No common plating room acid, except hydrofluoric, can attack tantalum metal. Unichrome Tantalum Coils, therefore, offer a money-saving means for controlling the temperature of acid solutions such as chromium plating baths. A New England company that installed two of them discovered after only one year that the coils had actually paid for themselves by eliminating both the cost of repair or replacement of former type of coils, and the downtime and loss of production normally experienced.

Many chromium plating difficulties eliminated

Case after case has shown that the Unichrome SRHS Chromium Bath virtually obsoletes the ordinary solution. Here are its chief advantages:

Important chemical constituents of the Unichrome SRHS bath are controlled automatically — maintaining the solution at top plating balance. This has slashed control time and maintained plating quality.

Higher plating speeds have been achieved—with plating time often cut 50% or more, and capacity of existing equipment increased.

This solution's wider bright plate range has reduced "burning" on edges and "missing" in recesses, thereby further cutting rejects.

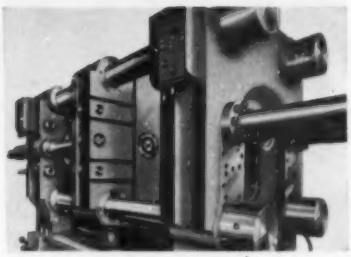
In hard chromium operations, its greater leveling action has reduced polishing time. Bulletin SRHS-2 gives more information.

Circle No. 101 Reader Service Card

UNITED CHROMIUM, INCORPORATED

100 East 42nd St., New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada:
United Chromium Limited, Toronto, Ont.

New Products ... the Reader Service Cards will bring full details



DIE CASTING MACHINE
. . . casts 52 lbs. aluminum

A new, larger die casting machine with a rated locking pressure of 1300 tons has recently been announced by one of the major machine builders of Italy. These machines are available in the U.S.

The machine has 58 x 65 inch platens with a maximum die opening of 39.5 in. (1 meter), with a total maximum clearance between platens of 65 in. When working as a cold chamber machine on aluminum the maximum shot is 52 lbs.

These machines can be equipped to operate entirely manually or on a fully automatic preset cycle. Maximum injection pressure is 83 tons.

Kelvin Systems, Inc.
For More information, circle No. 196 on the Reader Service Card

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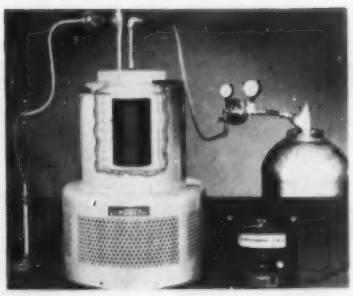

AMMONIA DISSOCIATOR
. . . for lab. atmosphere

Extensive tests have been completed on the first commercial laboratory size dissociated ammonia generator. This unit, the "Lab-Hyam," is now offered to metallurgical laboratories for test and pilot runs for such operations as: sintering or reducing powder metals requiring a strong reducing atmosphere; bright annealing; bright hardening; copper or silver brazing.

A 35-15 alloy catalyst chamber with a vertical inlet and a vertical outlet tube was designed to fit laboratory pot crucible furnaces made by the company. The tubes are welded to the cover plate of the furnace to form a complete gas tight unit. Pure nickel shot surround the tubes within the catalyst chamber.

Tests have shown that 99.90 percent dissociation is accomplished at 35 cubic feet per minute.

Lindberg Engineering Co.
For more information, circle No. 197 on the Reader Service Card

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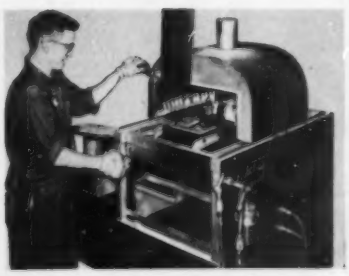


SHELL MAKING MACHINE
. . . doubles as core maker

A new machine for making shell molds known as the GEE Shell Mold and Core Making Machine is offered to the foundry industry.

One problem in shell mold manufacture has been the limited use of the metal pattern. GEE machines are said to be designed to use any metal pattern which will not disintegrate at the desired operating temperature. Another feature is that the machine will make shells and cores simultaneously when necessary, as long as the patterns and core boxes will fit under the dump box.

The shell size is controlled to the exact size of the mold. This saves much of the operator's time and eliminates extra labor.

Still another distinct advantage is that the operator can repair visible shell defects while they are on the machine, thereby reducing rejects.

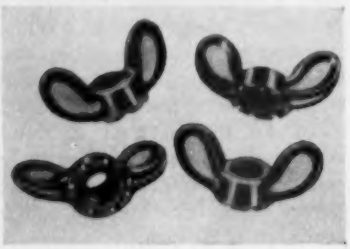
Metco Processing Corp.
For more information, circle No. 198 on the Reader Service Card

Continued on next page

DIE CAST WING NUT . . . is self locking

A new serrated base wing nut which frequently eliminates the need for a lock washer and speeds assembly has been introduced.

These self-locking wing nuts have been in use for some years by TV antenna manufacturers and, after successful testing, are



being added to the manufacturer's line of standard wing nuts to meet every industrial need and requirement.

Available in a full range of popular sizes, these wing nuts are made of rust-proof zinc alloy and feature a patented recessed thumb grip. In addition to a plain bright finish that withstands normal usages, they are also furnished in all commercial finishes.

Gries Reproducer Corp.
For more information, circle No. 201 on the Reader Service Card

SPRAY MASK PAINTING . . . with automatic machine

An automatic paint spray machine for masked painting of three-dimensional forms such as die castings, provides four distinctive, angular spray patterns per cycle to eliminate shadowing, assure uniform coverage.

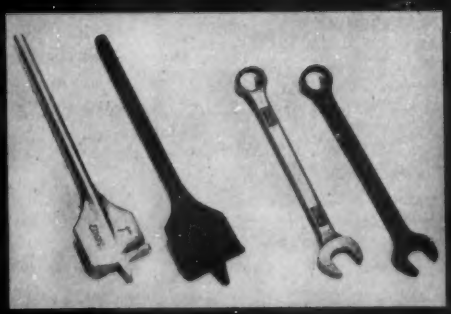
Spray totally enclosed to prevent escape of spray vapors into the room. Air flow inside unit prevents deposit of spray on guns and mechanism to minimize maintenance.

Pneumatic and hydraulic operation gives accurate control of speed of travel, amount of finishing material, and positive spray gun pattern. Gun angles are controlled by mechanical linkage and air cylinder to hold them in position throughout the stroke. Automatic timer has fine adjustment for any cycle from a fraction of a second to as many cycles as needed for coverage.

Simple adjustments make machine suitable for various sizes, shapes and types of work being painted. Simple installation needs only a single air line connection for rapid operation.

Seponski & Associates
For more information, circle No. 203 on the Reader Service Card

ALMCO
Supersheen
SPEED FINISHING
ALBERT LEA, MINN.



BARREL FINISHING Descaling COMPOUNDS

Recognized as the finest available, Supersheen offers a wide variety of *Descaling Compounds* that are "tailored to fit" your specific requirements. They provide, with various types of abrasive chips, accurately controlled processing — they produce clean surfaces and true colors — they are economical — and achieve consistently superior results.

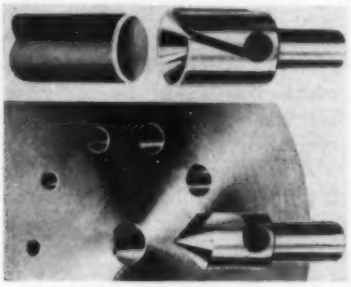
Send today for complete details of Almco Supersheen Compounds. Over 40 different standard types.

ALMCO Supersheen
AMERICA'S LARGEST MANUFACTURER OF ADVANCED BARREL FINISHING EQUIPMENT — MATERIALS AND COMPOUNDS
ALBERT LEA, MINNESOTA

Circle No. 88 on Reader Service Card

TWO DEBURRING TOOLS
. . . for holes & bosses

Two new companion tools, Nobursink and Noburod, have been introduced to debur and



chamfer openly accessible holes and the ends of rods, bosses and tubes.

Low torque design permits rapid off-hand workpiece handling without chatter or development of secondary burr, even on large diameters.

Controlled cutter entry prevents snagging, seizing or excessive cutting. Both tools have unique 2-piece construction permitting cone faces to be cylindrically ground on tool and cutter grinder or on any lathe with tool post grinder.

Application: less than 1/16" holes up to body diameter. Tools furnished with 90° included angle (for 45° chamfer) from high speed steel, heat treated and ground.

Nobur Manufacturing Co.
For more information, circle No. 204 on the Reader Service Card

DIE CASTING TRIM PRESS
. . . has greater capacity

Three new open-back, inclinable presses have been announced by one of the standard press builders.

The new presses feature extra wide beds, extra deep throats, extra large opening through the back, extra large ram faces and extra shut height. They are reported to be of particular interest to die cast trimmers because of these features.

The new line of presses are available in three capacities, 27 tons, 43 tons, and 56 tons. Either standard pin type clutches or Wichita air clutches are available for all presses.

The presses can be equipped as flywheel or geared models with higher speed, in strokes per minute, available on the fly wheel model.

Johnson Machine & Press Corp.
For more information, circle No. 199 on the Reader Service Card

PLASTIC MOLDING PRESS
. . . fully automatic, 2½ oz.

A new horizontal plastic injection machine with a capacity of 2½ oz., known as model H-250 has just been announced.

The press is reported to be capable of plasticizing over 22 pounds of material per hour, and attain up to 720 cycles per hour. Water cooling of the injection plunger, transfer hopper and oil cooler contribute to the high efficiency of the press.

For greater safety, the incorporated mold hydraulic mechanism makes the press nonoperative unless the molded part is completely ejected.

An automatic adjustable material metering device insures simplicity of operation.

Van Dorn Iron Works Co.
For more information, circle No. 200 on the Reader Service Card

DIE & MOLD MAKING
. . . simplified with new tool

A light weight, electrically operated, reciprocating tool whose speed can be varied from 0 to 12,000 strokes per minute is

Continued on page 97

Here is a new baking type synthetic finish for metal parts that combines unusual clarity with a high degree of chemical resistance.

Product of Maas & Waldstein Co. research, DURACHEM is almost water-white in color--and retains its clarity even after prolonged exposure to heat and sunlight. It also protects metal parts against the effects of salt spray and perspiration.

Typical applications include builders' hardware, vanity and cosmetic cases, lipstick shells and pen caps.

Where decorative color effects are desired on metal, DURACHEM can be supplied in a range of colors with the same chemical stability as the clear finish.

Samples and technical literature are available on request. Or an M & W technical consultant will discuss your requirements privately with you.

MAAS & WALDSTEIN CO.
211 McCARTER HIGHWAY
NEWARK 4, NEW JERSEY

Circle No. 94 on Reader Service Card

Prolong the life of your dies with PANGBORN HYDRO-FINISH®

Fine mesh abrasive suspended in water —that's how Pangborn Hydro-Finish precision cleans and finishes molds and dies. The result? Tolerances are held to .0001" and you get more years of service from your dies. In addition, Hydro-Finish eliminates further finishing operations by removing directional grinding lines . . . cleans off scale and discoloration in *minutes*.

For details on money-saving Hydro-Finish, send for Bulletin 1400A now! Write: PANGBORN CORP., 3500 Pangborn Blvd., Hagerstown, Md.

Pangborn

BLAST CLEANS CHEAPER
with the right equipment for every job

50th Anniversary Medallion

Circle No. 99 on Reader Service Card

Dr. R. A. Schaefer Elected President Of American Electroplaters Society

Dr. Ralph A. Schaefer, vice-president of the Clevite-Brush Development Co., a subsidiary of the Cleveland Graphite Bronze Co., has been elected president of the American Electroplaters' Society at the 41st Annual Convention. He succeeds Dr. George P. Swift of Boston, Mass.

The new head of the 45-year-old technical society is a native of Grafton, Ohio. He received his education at Notre Dame, Western Reserve and is widely known for fundamental work in the practical development of plated bearings and as author of many articles on related technical subjects.

Other national officers elected were: first vice-president, Clyde Kelly of American Plating Co., 808 Keo Way, Des Moines, Iowa; second vice-president, Dr. Samuel Heiman, chief chemist and technical director of Philadelphia Rustproof Co., Philadelphia, Pa.; third vice-president, Francis T. Eddy, assistant plant superintendent of the Chase & Brass & Copper Co., Waterbury, Conn.

The American Electroplaters' Society has branches in principal cities of the U.S., Canada, and Australia with members throughout the world.

AES RESEARCH COMMITTEE HEAD REELECTED

Dr. Earl J. Serfass, head of the Lehigh University Chemistry Department, was re-elected chairman of the Research Committee of the American Electroplaters' Society. This announcement was made by P. Peter Kovatis, executive secretary of the AES.

A recognized authority in the fields of chemistry, electroplating and metal finishing, Dr. Serfass is responsible for close to a dozen AES research projects being carried out in various universities, research foundations and private industry in the United States and Canada. His committee comprises 10 top men in the field with close to 100 additional members of the American Electroplaters' Society representing more than 40 large, medium and small corporations and several government agencies.

Other members elected to the Research Committee at the recent New York City convention include Leslie C. Borchert, Houdaille-Hershey, Detroit; Robert J. Racine, Wyandotte Chemicals, Wyandotte, Michigan; Arthur P. Wrisberg, Davies Supply, St. Louis; Myron B. Diggin, Hanson-Van Winkle-Munning, Matawan, N. J.; Lloyd O. Gilbert, Rock Island Arsenal, Illinois; Edwin R. Bowerman, Jr., Sylvania Electric, Long Island, New York; Arthur H. DuRose, Harshaw Chemicals, Detroit; Dr. Edward A. Parker, Technic, Inc., Providence, Rhode Island; and Dr. William Blum, Washington, D.C.

FINISHING EXPOSITION TO BE HELD IN 1955

The 1955 Industrial Finishing Exposition will be held in conjunction with the 42nd Annual Convention of the American Electroplaters' Society in Cleveland Public Auditorium, Cleveland, Ohio, June 20-23, 1955. The educational sessions and business meetings of the 42nd AES Convention will be held under one roof in the same building as the Industrial Finishing Exposition. It is anticipated that over 200 exhibitors will utilize a total of 100,000 square feet.

The 1955 Industrial Finishing Exposition will be attended by over 12,000 production supervisors, engineers, chemists and other executives from the over 8000 electroplating and industrial finishing plants.

NEW PRODUCTS
continued from page 95

available for die and mold work or any other job which requires hand filing or scraping.

Fitted with a wide variety of work tools, the unit is capable of doing all types of precision finishing that formerly had to be done by hand. The tool is said to work easily on both plane and irregular surfaces.

Engis Equipment Co.
For more information, circle No. 207 on the Reader Service Card

DIE HANDLER
. . . for large, heavy dies

To speed up the handling of large, heavy dies, a new low cost die handler has recently been introduced to the market.

The new model will handle dies measuring as large as 18 x 24 inches. It will hold the top die section by means of clamps which allow the operator to reach any screws on the top which hold punches or segments. The die is separated by means of an elevating crank which operates lead screws on both ends of the handler.

The unit is portable and can be moved easily around the shop. Means are provided for rotating the top section a full 360 degrees after the two halves of the die have been separated.

Hansford Mfg. Corp.
For more information, circle No. 202 on the Reader Service Card

PLATING BARREL
. . . built of hard rubber

A new plating barrel with a cylinder made of Tempron hard rubber has been announced. The new material and specially designed construction are said to offer advantages.

Tempron withstands, even under load, higher temperatures than have been possible to use with any thermoplastic material, such as lucite or plexiglass. Tempron cylinders can be used effectively through the entire plating cycle. Better abrasion re-

Continued on next page

Barrel finishing boosts die maker's production 5000%

This almost unbelievable production increase was made by Callahan Can Machine Co., Inc., makers of bottle cap dies, when they switched to the HONITE Barrel Finishing Method. Too, per-unit labor costs for finishing were cut by a phenomenal 99.8% !

Dies are used to stamp out painted bottle caps. The problem was to remove sharp edges so that paint on the cap flanks would not be scratched. Former method of hand stoning each die resulted in low production with many rejects because hand stoning did not effectively round off the edges.

A HONITE barrel finishing machine, using SUPER-HONITE chips and the recommended HONITE compound was installed. Production immediately jumped to several hundred pieces per day.

Dies came out perfectly uniform, quality was improved and the reject problem was eliminated completely!

METAL FINISH, INC., Newark, N.J., is the HONITE distributor servicing the Callahan Can Machine Co. Your HONITE distributor can help you increase production and cut costs, too. Call him today!

Honite BRAND

MINNESOTA MINING & MFG. CO., Dept. PM-94, St. Paul 6, Minn.
I'd like to get more facts about HONITE Service.
☐ Send me free copy of "3M Barrel Finishing" Manual
☐ I'd like to talk with a HONITE Sales Engineer
NAME.....TITLE.....
COMPANY.....
ADDRESS.....
CITY.....ZONE.....STATE.....
Type of product to be finished.....

Made in U.S.A. by Minnesota Mining and Mfg. Co., St. Paul 6, Minn.-also makers of "Scotch" Brand Pressure-Sensitive Tapes, "Scotch" Sound Recording Tape, "Undercoat" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N.Y. In Canada: London, Ont., Can.

3M

Circle No. 95 on Reader Service Card

a special message for hardware manufacturers

need a finish for protection—decoration—identification? specify IRIDITE®

Specify Iridite . . . for corrosion protection during storage or use . . . for a firm and lasting base for paint . . . for extra quality and eye-appeal . . . for low cost color coding of finished parts.

ON ZINC AND CADMIUM you can get highly corrosion resistant finishes to meet any military or civilian specifications and ranging in appearance from olive drab through sparkling bright and dyed colors.

ON COPPER . . . Iridite brightens copper, keeps it tarnish-free; also lets you drastically cut the cost of copper-chrome plating by reducing the need for buffing.

ON ALUMINUM Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.

ON MAGNESIUM Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.

AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

WANT TO KNOW MORE? We'll gladly treat samples or send you complete data. Write direct or call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

Iridite is approved under government specifications

ALLIED RESEARCH PRODUCTS INCORPORATED

4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals, ASP Plating Chemicals.

WEST COAST LICENSEE: L. H. Butcher Co.

Circle No. 87 on Reader Service Card

New Products — Cont.

sistance and resistance to strong acids are claimed.

The new design is said to offer greater strength than even the one-piece construction. An ingenious system of interlocking panels and ribs not only makes it stronger but also permit the easy individual replacement of component parts as needed.

The Udylite Corp.

For more information, circle No. 205 on the Reader Service Card

BELT POLISHER

. . . mounted on single base

Known as the Bader Space Saver, a new belt sander and polisher has been introduced that eliminates the usual two base backstand type of unit. The new unit has the contact wheel, idler wheel, and drive motor mounted on a single pivotal base.

The unique single-based polisher not only saves space but simplifies installation, eliminates tracking problems, and minimizes adjustments during operation.

By mounting all operating equipment on a balanced base, it is easy for the operator to change working heights from a sitting to a standing position. He merely loosens one bolt, swings the balanced unit to the desired position, and retightens the bolt. Tracking and belt tension remain unaffected.

Stephen Bader & Co.

For more information, circle No. 206 on the Reader Service Card

BARREL PLATING UNIT

. . . has insulated drive shaft bushing

In order to cut down stray power losses and insure that all of the D.C. current goes into the barrel one manufacturer now uses a nylon insulating sleeve over the solid brass drive shaft.

This insulating bushing provides a strong wearing surface for the drive gear and completely insulates the driving assembly. Another outstanding advantage is that all arcing through the gears is eliminated, thus reducing gear wear.

Daniels Plating Barrel & Supply Co.

For more information, circle No. 208 on the Reader Service Card

Product Facts

Catalogs · Manuals · Brochures

PROCESSES

Porosity-Free Castings: 144
The production of porosity-free aluminum castings is covered in a new brochure that has been issued by Aluminum Alloys Corp.

Investment Casting: 145
Details of the process and full information on ethyl silicate as an investment bonding material are contained in a 19-page booklet and two reprints available from the Bakelite Co.

Shell Molding Manual: 146
A 27 page booklet covering all phases of shell molding including step-by-step procedures, testing of the resins, sand, resin-sand mixtures, etc. has been issued by General Electric Co.

Grooved-Type Sintered Bushings: 147
An engineering report on the new grooved type sintered bushings, their properties and applications can be secured from Wakefield Bearing Co.

Metal Powders: 148
A description of the various metal powders, with special emphasis on iron powder, and some notes on the various uses of metal powders are contained in a brochure from Plastic Metals Div. of National Radiator Co.

Permanent Mold Castings: 149
A general description of the permanent mold process and some of its advantages is covered in a brochure from Peasley Products, Inc.

Designing Investment Castings: 150
A new booklet has been published by Midwest Precision Castings Co. giving considerable information on the proper design of parts to be made as investment castings. Included are tables and charts of value to the design engineer.

Aluminum Bronze Castings: 151
Special high strength, heat treatable alloy castings are described in a brochure that has been issued by WW Alloys, Inc., Div. of the Fansteel Metallurgical Corp.

To get copies of any item listed here, simply circle the appropriate number on Reader Service Card bound into this issue.

Investment Castings: 152
The design, production and suggested uses of investment castings are covered in a brochure from the Cadmet Corp.

MATERIALS AND EQUIPMENT

Induction Heating & Melting: 155
A four page brochure has been published by Electric-Arc, Inc. giving details of their induction melting and heating equipment.

Metal Melting Furnaces: 156
In a four page brochure, Campbell-Hausfeld Co. describe and illustrate several of their fuel-fired melting furnaces. Included are tables of capacities and dimensions of the different units.

X-Ray Inspection: 157
A folder describing the analytical facilities of X-Ray, Inc. has been issued. Spectrographic, wet chemical, metallographic, X-ray, and radiographic (Cobalt 60 or Radium) inspection methods are noted.

Self-Locking Fasteners: 158
Catalog No. 11A has been issued by The Nylock Corp. giving complete information about all of the standard and special fastening devices made by that company.

Dielectric Core Ovens: 159
A new bulletin, No. 654, has been issued by The Foundry Equipment Co. describing, in detail, the Coleman dielectric core ovens made by that company.

Electrolytic Iron Powder: 160
In a 30-page booklet, the properties and uses of electrolytic iron powder are thoroughly expounded. Numerous charts comparing different grades of powders and showing relationship between physical properties and molding variables are given. The booklet also gives suggested powder metallurgical procedures for making structural parts to meet given physical properties. Illustrations show some of the parts being made and the saving over conventional methods of manufacture. The booklet is distributed by A. Johnson & Co.

Continued on next page

WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11
WHAT'S THE MOST ECONOMICAL WAY?
See page 9
Some good things to know about Metal Cleaning
OAKITE PRODUCTS, INC.

Oakite's FREE Booklet on Metal Cleaning

answers many questions that mean better production, more profit for you. Just look at the table of contents:

- Tank cleaning methods
- Electrocleaning steel
- Electrocleaning nonferrous metals
- Pickling, deoxidizing, bright dipping
- Pre-paint treatment in machines
- Pre-paint treatment in tanks and by hand
- Paint stripping
- Machine cleaning methods
- Steam-detergent cleaning
- Barrel cleaning
- Burnishing
- Better cleaning in hard-water areas
- Treating wash water in paint spray booths
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Send me a copy of your booklet *"Some good things to know about Metal Cleaning"*

NAME.....

COMPANY.....

ADDRESS.....

Circle No. 98 on Reader Service Card

Product Facts — Cont.

Shell Bonding Resin: **161**
The General Electric Co. has just issued technical data sheets on their G-E 12316 Resin. The material is reported to be especially well suited for the rapid, economical bonding of shell molds. Other suggested uses are also covered.

Alloy Steel Powder: **162**
Vasco 4650-A is the latest addition to the growing line of pre-alloyed metal powders. Descriptive literature on this powder giving technical data and typical properties of compacts made from it is available from Vanadium-Alloys Steel Co.

Investment Casting Equipment: **163**
The Ecco High Frequency Corp. has recently issued three new bulletins describing their centrifugal casting machine and high frequency motor generator melting units.

Zirconium Metal: **164**
A new booklet on metallic zirconium containing in its 65 pages the full story of zirconium metal, its extraction, fabrication and critical data has been published by The Carborundum Metals Co., Inc.

Packing Data: **165**
Six new technical bulletins, each featuring essential data on individual types of packings, have

Companion tools — NOBURSINK for openly accessible hole faces and NOBUROD for outer ends of rods, tubes and bosses — provide greatly improved work quality, faster and easier than ever before. Both have low torque design permitting rapid, off-hand workpiece handling without chatter — even on large diameters. Unique design allows regrinding without special tools.

Eliminate makeshift and less efficient tools

Both NOBURSINK and NOBUROD tools work equally well on all metals. Cutting chips are freely expelled from the work area. Each tool accommodates a wide range of work size — and are furnished 90° included angle (produces 45° chamfer).

WRITE for FULL DETAILS TODAY!!

NO/BUR TOOLS **NOBUR** MANUFACTURING CO.
717 No. Victory Boulevard, Burbank, California

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been issued by E. F. Houghton & Co. The bulletins cover synthetic rubber packings and leather packings.

Drilling Machine: 166
Described as radically new, a turret drilling machine manufactured by Howe & Fant, Inc. is fully described in a brochure from the company.

Molybdenum Disulfide: 167
A technical report on methods of dry bonding molybdenum disulphide to metal bearing surfaces by tumbling is available from the Alpha Corp.

Colloidal Dispersions: 168
An 8-page booklet has been prepared by the Acheson Colloids Co. describing the colloidal dispersions of graphite and molybdenum sulfide made by them and giving a number of suggested uses where these products are said to be specifically indicated.

Beryllium Master Alloys: 169
Penn Precision Products, Inc. has issued a new bulletin describing and giving metallurgical data on their beryllium casting alloys and master alloys.

Reports on Finishing Methods: 170
Two important discussions on finishing materials and equipment are featured in Vol. 2, No. 3, of Metalwash Finishing Engineer. They are: "What You Should Know About Vapor Degreasing" and "Phosphate Coating Comes of Age."

Continued on next page

LARGE HOLE TAPPING
MADE EASY!

With the New Heavy Duty

"TAP KING"

Whether you're tapping in 1½" steel plate, threading ¾" pipe, tapping "blind" in steel castings or open tapping in high carbon forgings — you'll be amazed at the "handling ease" of this heavy duty tapping attachment. The secret is in the heart of the unit which includes: an improved sensitive friction clutch; a new helical gearing mechanism; ball and needle bearings and the exclusive 17 tooth spline drive from clutch to tap holder which gives a smooth, powerful drive with less strain, wear and vibration.
Find out more about this "production" marvel, see how it can increase your production, save on tap breakage and parts spoilage.

NEW! "TRU-GRIP" TAP HOLDER
Is lighter, smaller in diameter. It affords easier tapping close to walls.

Write for FREE brochure
giving full details and specifications on the TAP KING and the complete line of Procunier Tapping Attachments.

PROCUNIER Safety Chuck Company
14-16 S. Clinton St., Dept. 9, Chicago 6, Ill.
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Foremost in Quality . . .

Sel-Rex
Completely Sealed

SELENIUM RECTIFIERS

If a manufacturer intends to maintain a prominent position in a highly competitive business, his production equipment must be the most modern and efficient made.

SEL-REX places no limitation on engineering to achieve the finest DC power plant . . . nor compromise in the choice of component parts to "bring the cost down." True, such a policy may reflect a slightly higher initial cost . . . but in the long run a SEL-REX UNIT is the most economical. There are no moving parts to wear out — no maintenance expense, no loss of production.

SEL-REX RECTIFIERS available for every requirement from 25 to 50,000 amperes including completely sealed water cooled and air cooled models.

Write for complete details.

BART-MESSING CORPORATION
Dept. PM-9, 229 Main Street, Belleville 9, N. J.

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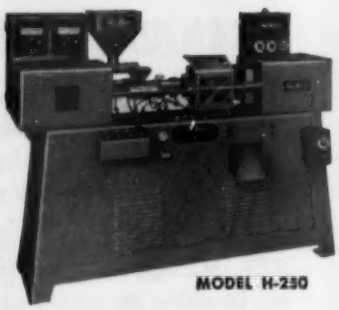
Investment Casters *Prefer*
VAN DORNS for
molding styrene patterns

Typical precision parts produced by investment casting, using styrene patterns molded to .003" tolerances on Van Dorn Presses.

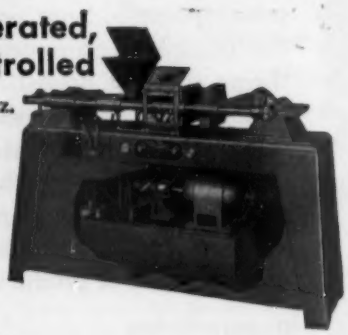
2½ oz. Automatic and 2 oz. Semi-Automatic Presses

These injection presses feature safe, simple push-button controls. Accurate temperature regulation. Rugged, compact, quiet.



MODEL H-230

Power-Operated, Lever-Controlled Presses — 2-oz. or 1-oz. models. Have many automatic and safety features.



MODEL H-200

Plastic Grinder — grinds up waste, rejects, etc., for re-use.

Mold Bases for these presses available from stock.

Write for information on this equipment.

MODEL G-100

THE VAN DORN IRON WORKS CO.
Cable Address: "VANDORN" Cleveland
2693 East 79th Street · Cleveland 4, Ohio, U.S.A.

Circle No. 85 on Reader Service Card

Piston Rings: 171
Piston rings for industrial equipment such as die casting machines, hydraulic cylinders, etc. are described and the various types and sizes made in a new catalog from Auto-Diesel Piston Ring Co.

Automatic Controls: 172
A folder on automatic controls that can be adapted to manually controlled hydraulic compression presses, batch process machinery, or where cyclical operation is required, is available from the Seely Instrument Co., Inc.

Ultrasonic Soldering: 173
Ultrasonic soldering equipment has been developed for soldering aluminum, copper, magnesium and silver. Full information on the equipment and its applications can be secured from Aeroprojects, Inc.

Control Instruments: 174
Wheelco Instruments Div. of Barber-Coleman Co. has released information circulars on the new 400 series Capacitrols. The new instrument is a direct deflection indicating controller and is available for a wide variety of control functions.

Optical Comparator: 175
A new, portable optical comparator has been announced by Stocker & Yale, Inc. Full details on this new inspection instrument are available.

Continued on page 107

GET GENUINE IMS SILICONE SPRAY from
INJECTION MOLDERS SUPPLY CO.
3514 Lee Road Cleveland 20, Ohio

BEWARE
OF CHEAPENED IMITATIONS!

YOU GET JUST WHAT YOU PAY FOR IN MOLD RELEASES

* *MORE of the Right Silicone*
* *FEWER PIECE MARKS from Costlier Drier Propellent.*
* *BETTER ATOMIZATION*
* *FASTER SHUT OFF With Exclusive All Metal Spray Head.*

Delivered Prices:

Sample .	$2.00 ea.
Dozen .	$1.50 ea.
Gross . .	$1.37 ea.

DON'T RUN OUT!
Lower Prices on Larger Orders Shipped Prepaid as Needed on Your Schedule. Write for Money Saving Details Now.

Circle No. 45 on Reader Service Card

LEAD CASTINGS
continued from page 72

crease in number of members between grids of Figures 3 and 4 was accomplished without a proportionate increase in weight. By contour control it was possible to obtain the mechanical and electrical design benefits of added members without sacrificing the high active material volume obtained from the grid of Figure 3.

The diamond "Z" grid is produced on automatic casting equipment, Figure 5. The repetitive cycle of the equipment permits instrumented temperature controls which affect casting quality, thus reducing some of the controls previously required by hand operation.

New data on metal flow patterns permitted the diagonal design with its strong construction features. Some variation in member cross-section was found possible if the amount and rate of change were controlled. Thus micro-porosity effects are avoided as well as solidification cracking.

How Dross Is Controlled

Dross was controlled in the new production by withdrawing the metal for pouring from below the melt surface and conducting it to the mold through a closed pipe. This prevented reaction between molten metal and air to form dross during transfer. Dross formation during the period of metal fall into the mold is controlled by partial gas atmosphere. Dross formed during initial metal passage through the mold is filtered out by a novel gate design. By taking advantage of density differences, the low density dross is forced to float up into a scrap portion of the cast. Dross formed by metal contact with air it displaces in the mold is forced by control channels to flow into dead end scrap portions of the cast also. An unusually high degree of freedom from dross inclusions has been obtained with the new design.

The creation of casting cracks by mechanical ejection has been eliminated by having one set of casting knock-out pins operate on a scrap portion of the cast and a second set operate on a controlled chill cast portion of the casting whose complete freezing is certain before impact.

By control of rate of cavity change in the mold and by taking advantage of the diagonal members, the advance of metal is uniform preventing gas entrapment.

The diamond "Z" grid is gated along one side of longest dimension. The feeding of many members simultaneously without loss of control

Continued next page

Fishin' For Cost Reduction?

this reel-seat undercut was cast in — saving the maker an expensive milling operation

Material: Aluminum Alloy
Length: 9-11/16"
Weight: .21 lb.

Paramount die designers developed a double cam-actuated core to produce the undercut on this fishing rod handle. Ferrule and butt holes are also cored. Result: the manufacturer pockets the machining cost previously necessary to reel seat production.

Although your product design problems probably are much different from those of a fishing tackle manufacturer, this casting illustrates what can be done when engineering know-how, die making skill and modern die casting techniques combine to tackle your problems. A complete die casting service is available to you at Paramount from blueprint to finished product.

Full information available upon request.

ALUMINUM, ZINC AND MAGNESIUM DIE CASTINGS
PARAMOUNT
Die Casting Company
St. Joseph 1, Michigan

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FISKE

FORGING AND DIE CASTING LUBRICANTS

- GREATER PRODUCTION
- BETTER FINISH
- FEWER REJECTS

Fisk offers two outstanding Die Lubricants for Die Casting and Forging, Upsetting, Extruding and Piercing of all metals.

No. 514 A HOT DIE LUBRICANT is a graphited product for use at temperatures to 2200° F. and over. It prevents hot metal from seizing dies or punches. Produces excellent finish with reduced smoking.

No. 231 DIE CASTING COMPOUND produces fine zinc and aluminum Die Castings. Does not fume, flash or give off offensive odors. Reduces soldering and carbon formation. Minimum gas formation results in stronger castings.

GOOD LUBRICANTS A BIG AID IN WORKING ALUMINUM

These Fiske Lubricants are especially recommended for the successful working of Aluminum and Aluminum Alloys.

Machining	CSA 52 Cutting Oil
Rolling	Majestic Soluble Oil
Die Casting	231 Die Casting Compound
Stamping	Magic Compound
Forming	Magic Compound
Wire Drawing	Magic Compound

Cleaner Product and less tool wear are the reasons why Fiske Lubricants are used in progressive metal working plants that produce the highest type of aluminum products.

Full information on each of the many Fiske Lubricating Specialties is available in bulletin form. Send for bulletins describing lubricants of interest to you.

FISKE BROTHERS REFINING CO.

154 Lockwood Street, Newark 5, N. J.
WORKS: Newark, N. J. and Toledo, Ohio

FISKE'S

Since 1870

METAL WORKING LUBRICANTS

Circle No. 37 on Reader Service Card

over metal flow became possible by preventing choke feeding. This avoided turbulent flow which creates flaws.

Cooperative application of research results among design, metallurgical and production departments has resulted in a product of increased user value. The design engineer has been able to incorporate new and effective mechanical and electrical advantages in design; metallurgical control has established casting conditions resulting in a product capable of delivering full potential life inherent in the metal; and the production department can maintain the new standard of quality without operating under as restrictive techniques as before.

A superior battery of long life, high active material content and efficiency has been made available to the user.

ALUMINUM DIE CASTINGS
continued from page 57

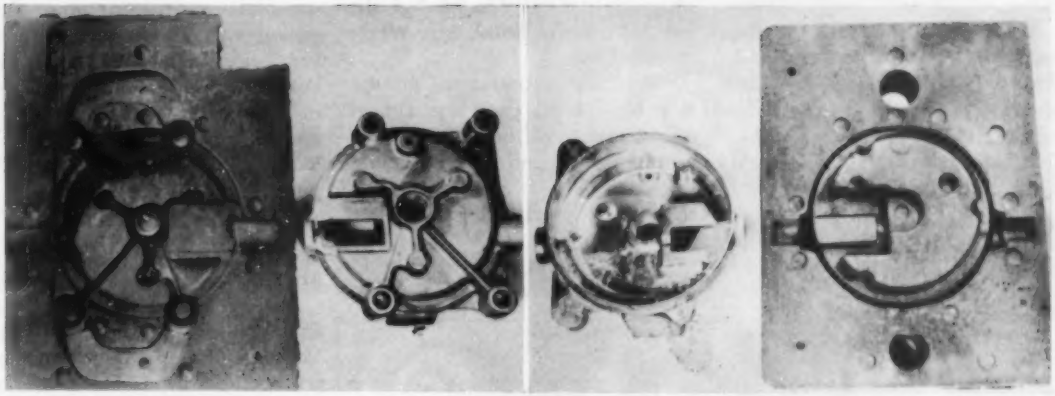
die cast in aluminum where pressure-sealing is important, but manufacturers of hydraulic equipment now commonly use this metal for pumps, housings, fittings, valves and other important parts.

Thermal conductivity, another factor which has influenced the choice of die cast aluminum, should also be considered. The high conductivity of die cast aluminum has led to its application in cooking ware, electric irons, portable tools which must operate cool, and other such products.

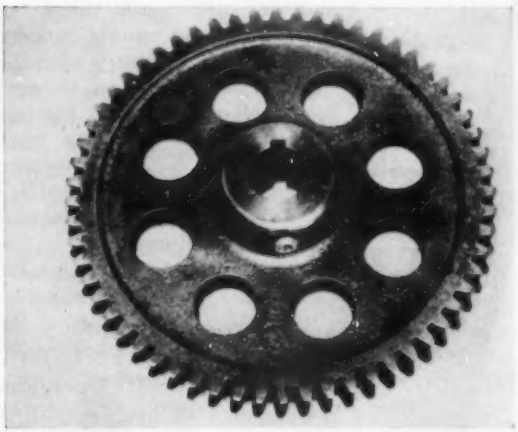
In motive equipment, especially, the trend is to higher speeds, greater power output and smaller packages. Properly designed aluminum die castings have materially aided in all of these phases. For example, one manufacturer has found that through the use of aluminum parts on a motor rotor, the power developed could be increased about 40 percent without changing either the amount of copper or iron used in the motor.

This suggests still another property of aluminum that has been put to use in the form of die castings: electrical conductivity. One of the important uses for die cast aluminum is the rotor of small electrical motors. Techniques have been developed for injecting molten, commercially pure aluminum into a stack of laminations so that high density for optimum electrical properties is obtained. This lowers the cost and improves performance on small motors, produced by the million each year in this country.

The various specific qualities found in die cast aluminum have been outlined above. In all cases, the natural economy of the die casting process itself is the primary consideration.



1. TOP AND BOTTOM VIEWS of aluminum bowl casting, with shell halves that formed the casting.



2. LARGE GEAR is shell mold cast to save expensive machining.

Where Six Castings Have Saved $30...

IN a machine that retails for $300, the manufacturer has been able to cut his costs by $30 per unit through the use of more precise castings.

The machine: a new, automatic ice crusher for use on counters, is manufactured by Brockman Tool & Mfg. Co., Bala-Cynwyd, Pa.

The castings: shell mold castings in aluminum and G-metal, cut production costs by about 20 percent, mostly due to a reduction in machine finishing operations.

The components: heavy duty, working parts, including an intricate bowl, feeder guide, base, top plate, gear case and gear.

Characteristics: are improved, according to the manufacturer, who points out that the shell mold castings have greater density, ductility and strength than sand castings.

The high percentage of sound castings obtained is due to high permeability of the Bakelite resin-bonded, thin sand shell which permits gases to escape, thus eliminating blowholes and other surface imperfections.

The savings: are brought about by reduced machining because of the high accuracy of the castings. The intricate bowl, Figure 1, measures 10½ x 10½ x 3½ inches. This piece formerly required facing, boring, reaming, tapping and drilling . . . now needs only drilling and tapping of 10 small holes and reaming three bores. The gear, Figure 2, is not cast in aluminum as are the others, but is cast in G-metal, also in shell molds. By using shell molding, one or more expensive machine operations has been saved on each of the components.

ALUMINUM INDUSTRY SETS NEW QUARTERLY PRODUCTION RECORD

A new quarterly production high of 732,515,499 pounds climaxed the record breaking pace set by the U. S. aluminum industry during the first half of 1954, according to Donald M. White, secretary of The Aluminum Association.

New monthly records in primary production of the lightweight metal were set in January, March and May. First quarter production established a new record at 698,137,342 pounds only to be surpassed by the second quarter total, Mr. White said, adding:

"Primary production in the first half of the year was almost 20 percent over the 1,198,407,109 pounds produced in the same period of 1953 and almost as much as during the entire year of 1950."

Coming months are likely to see further increases in primary production, Mr. White predicted. Although the "second round" of aluminum expansion is now complete except for one plant which will not begin operation until early next year, some new equipment is not yet in full commercial production. Capacity operation of this new equipment would bring new records in the second half of the year.

SHELL MOLD FILM OFFERED

A new 25-minute sound slide film in color, "Shell Molding and You," is offered by General Electric Company's Chemical Materials Department.

The film, which may be borrowed for showings, is designed to acquaint foundrymen, buyers and designers with the latest benefits of this casting process. Included is the history of metal casting in cartoon form, showing how shell mold casting fits into the evolution of casting techniques, along with step-by-step demonstration of shell molding in G-E's experimental foundry in Pittsfield, Mass.

ASTE SHOW IN WEST MAY BE BIGGEST

Floor plans for the American Society of Tool Engineers' first Western Industrial Exposition in Los Angeles next March reveal that the show will be not only the first of its kind but probably also the West's biggest industrial exposition.

The floor plans and space applications are now being mailed from the Society's headquarters at 10700 Puritan avenue, Detroit 38, Michigan.

The floor plans reveal that 80,000 square feet of actual exhibit space has been made available to manufacturers of tool, machines, industrial supplies, processes and equipment in four adjoining exhibit areas of the Los Angeles Shrine Auditorium and Shrine Exposition Hall. This is believed to be a record amount of space for any west coast industrial show, according to Harry E. Conrad, ASTE executive secretary.

Our Claim to Fame—

"quality and service"

• quality

Produced in America's most modern smelting plant . . . Sall Metals assure you of bright, flawless castings.

• service

Fast delivery with our own fleet of trucks. A metallurgical service for all die casters.

Write today for specifications

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2300 East Butler Street • Philadelphia 37 • Pa.

"Better Metals for Better Castings thru Creative Metallurgy"

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PRODUCT FACTS

continued from page 102

Rotary Finishers: 181
A multi-spindle rotary finisher for light machining and surface finishing is fully described and illustrated in an eight-page booklet from J. M. Nash Co.

Grits and Grinds: 182
The monthly house organ of the Norton Co. is devoted to uses, care, and applications of abrasive products. It will be sent to interested users of abrasive products. One article this month is titled, "Check Your Grinding Practice."

Surface Protection: 183
Surface protection through Bonderizing or Parkerizing is discussed and typical applications shown in The Parkerizer, house organ of the Parker Roof Proof Co.

Automatic Plating Machine: 184
A five-page folder from Wagner Bros. describes and illustrates their new automatic plating units. All components, controls, accessory equipment, etc. are fully described.

Stress Measurements: 185
The measurement of stresses in electrodeposited coatings is described and illustrated in a resumé of a paper that was given before the American Electroplaters Society available from Joseph B. Kushner Electroplating School.

Semi-Automatic Spray Painting: 186
A brochure from Conforming Matrix describes their semi-automatic spray painting machine. The new portable unit is said to be capable of painting up to 1500 pieces per hour using masks up to 3 x 1½ inches.

pH Control: 187
A new bulletin on complete instrumentation for pH measurement and automatic control has just been published by the Bristol Co. The bulletin covers complete installations including all necessary control instruments and auxiliary equipment.

Improved Corrosion Resistance: 188
A new nickel brightener that is said to give up to 30 percent more corrosion resistance to bright nickel electro deposits is described in literature from Plater's Research Corp.

Electrocleaning Compound: 189
For the cleaning of brass and copper, prior to electroplating, Oakite Products, Inc. have developed a new cleaning media. The new composition No. 191 is fully described in a brochure that is ready for release.

Slide-Honing: 190
A new, modern precision tumbling process, is described in a booklet published by BMT Manufacturing Corp. Metals, plastics, castings and parts previously considered impractical to finish by tumbling are said to be handled successfully by the new machine.

LIGHTNESS of WEIGHT is ESSENTIAL for PORTABLE TOOLS

Many Manufacturers Have Solved Their Needs for Making Tools REALLY Portable by Using Magnesium or Aluminum Die Castings.

Not only do magnesium and aluminum die castings greatly reduce weight but their toughness and mechanical strength are adequate for the vigorous use to which they are put in such products as portable tools. Furthermore, the great reductions in weight that these lightweight alloys effect reduce working fatigue — thus increasing productivity in the use of these tools.

The photograph illustrates Chain Saw parts die cast from aluminum and magnesium. They are all typical applications and include: 1. and 2. Drive Pulleys, 3. Cylinder Head, 4. and 5. Blower Housing, 6. Handle, 7. Gas Tank Cover. Components such as these have, when die cast, offered greater scope to the designer, and to the manufacturer, important savings through the virtual elimination of machining, finishing and assembling.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

LITEMETAL DICAST, Inc.
A DIVISION OF HAYES INDUSTRIES
1925 WILDWOOD AVE • JACKSON, MICHIGAN

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Looking For A Dependable Die Casting Service?

It's yours for the Asking

Die castings to specifications . . . that's our specialty. You'll get the job done the way you want it when you specify Racine, and you can be sure your tools and dies are fully protected in our special fireproof storage vaults. We invite your inquiries and will welcome an opportunity to serve your die casting requirements.

Send for our new, free brochure.

RACINE DIE CASTING CO.

1500 16th St. • Racine, Wis.

REFERENCE DATA
continued from page 20

67. DESIGN and buying information to help in specifying and procuring zinc and aluminum die castings is included in literature from Paramount Die Casting.

69. DIE CASTING brochure is made available by Precision Castings Co., presenting the company's facilities.

71. DIE CASTING plant, and typical die castings produced for customers, are part of a brochure from Racine Die Casting Co.

72. COMPLETE DATA on a full line of hot and cold chamber die casting machines are included in catalog 954 from Reed-Prentice.

73. STAINLESS LADLES for die & permanent mold casting that are lighter in weight and last longer are listed in a bulletin from Spincraft.

74. MODERN PRECISION investment casting is the title of a 12-page data book from Alexander Saunders & Co.

80. ALLOY SPECIFICATIONS for die casters are available from Geo. Sall Metals Co.

81. NON-FERROUS MELTING furnaces are described and illustrated in a complete catalog from Stroman Furnace & Engineering.

83. PRICE LIST of investment casting silica is offered by Tamms Industries, including amorphous, crystalline and diataomaceous silica.

85. INJECTION MOLDING machines for making plastic patterns used in investment casting are introduced in a catalog from Van Dorn Iron Works.

86. IMPROVED BARREL finishing equipment is reported in detailed literature from Abbott Ball Co.

100,000 R.P.M.

NU-JETT

PNEUMATIC PENCIL GRINDER

EASY TO CONTROL AS A PENCIL

Nu-Jett Does Any Fine Precision Grinding, Polishing or Finishing

Use it for etching, deburring, die work, pattern making and engraving. A precision tool, simple in principle with the advantages necessary for small tipped tools and COMPLETE SAFETY!

Actual Size 1/8" x 5 1/16" Weight 5 1/4 oz. MODEL NJ-100 1/8" chuck Adapters for 3/32" chuck available

$42.50

Complete as illustrated includes NU-JETT GRINDER, AIR FILTER, AUTOMATIC LUBRICATOR, HOSE and CHUCK WRENCHES.

Detroit Mold Engineering Co.

6686 E. McNichols Road DETROIT 12, MICH.

BRANCHES — Hillside, N. J., Chicago, Ill., Cleveland, Ohio, Los Angeles, Cal.

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Ready to Deliver Highest Quality

Smelters Aluminum Alloy

For die casting, permanent mold casting and sand casting. Our alloys are rigidly controlled to meet the most exacting specifications.

• We also produce hardeners in ingot and shot form for use in zinc base die casting alloys.

General Smelting Company

2901 EAST WESTMORELAND ST., PHILADELPHIA 34, PA.

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87. PROTECTIVE AND Decorative coatings that can be applied to die castings at room temperature without electrolysis are the subject of literature on Iridite from Allied Research.

88. MORE THAN 40 different types of compounds for barrel finishing are included in Almco Supersheen's complete barrel finish catalog.

89. EFFICIENT RECTIFIERS for electroplating are presented in literature from Bart-Messing Corp., including specifications on their line of completely sealed selenium rectifiers.

90. ABRASIVE GRAIN for all types of polishing and metal finishing operations are described in literature available from Carborundum.

91. HOW TO ASSEMBLE die castings by means of thread cutting screws can be learned from literature offered by Central Screw.

92. PLATING SPECIALISTS, the Four Plating Company, offer a brochure to show their facilities for automatic polishing and plating of die castings on a contract basis.

93. THREADED INSERTS that can be driven into die castings without a separate tapping operation are described in Groov-Pin Corporation's descriptive folder on Tap-Lok inserts.

94. SAMPLES and technical literature on a new, water-white, chemically resistant baking finish for metal products are offered by Maas & Waldstein.

95. BARREL FINISHING manual is offered by Minnesota Mining & Mfg. Co. describing methods, materials and equipment.

96. DEBURRING inside and outside diameters with two new tools is the subject of detailed literature available from Nobur Mfg. Co.

97. CAST ALUNDUM tumbling abrasives are described in literature ready for distribution from Norton Co.

98. METAL CLEANING methods are outlined in Oakite's 44-page illustrated booklet.

99. LENGTHEN DIE LIFE by finishing them by Hydro-Finish, described in a booklet from Pangborn Corp.

101. TWO PLATING bulletins, one on new Unichrome pyrophosphate copper plating solution and the on Unichrome SRHS chromium bath, are listed by United Chromium, Inc.

ELECT OFFICERS

The Alhambra Foundry Co., Ltd., Alhambra, Cal., has announced the election of new officers and directors as follows: Clyde E. Hopping, chairman of the board; J. Stanley Ashton, president; Paul C. Siechert, secretary-treasurer and general manager; Robert J. Hopping and Glydon A. Hopping, vice presidents in charge of sales; Gerald H. Meyn, director and general superintendent; John T. Sofranke, director.

HOEGANAES

Sponge Iron Powder

FOR BETTER GREEN STRENGTH

IN HARD TO MAKE PARTS

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ANCOR 80

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For Design Consultation

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Sellers of Hoeganaes sponge iron powder

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What is YOUR PRODUCTION PROBLEM?

Investment Castings by **ARWOOD** will solve these problems.

ALLOY High strength, hard to machine alloys are cast, eliminating production and performance problems.

MACHINING Tricky shapes, involving complicated machining, are investment cast to shape.

ASSEMBLY Several small parts can be cast as one unit, eliminating assembly.

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For complete details on the process we will gladly furnish our booklet "Alloy Selection and Design for Precision Casting".

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ARWOOD offers:

CAPACITY 4 production plants with complete tooling facilities.

METALS Castings in all ferrous and non-ferrous alloys including magnesium.

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SERVICE Sales engineers in every large industrial center of the country.

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Circle No. 12 on Reader Service Card

Size Limits For Die Casting Extended By New Machine

DIE castings can be used today in many more places than were thought possible twenty years ago. The reason . . . ?

Improved die casting technology has brought about improved alloys, bigger castings, smoother surfaces, sounder internal structures and many other attributes.

Each of these advances in the art and science of die casting has opened up new fields of application.

One leading builder of outboard motors tells how, in the early days, he tried to have engine blocks for outboard motors die cast. It can't be done, he was told . . . and if it could, it wouldn't be economical.

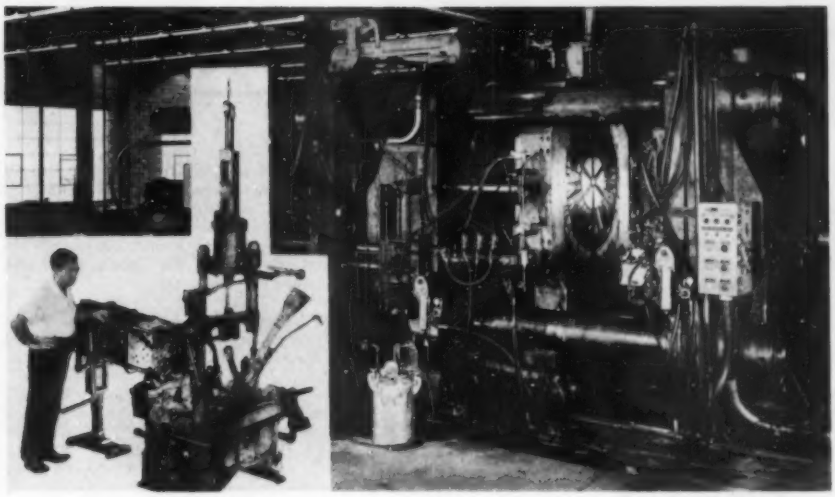
Today, outboard engine blocks are produced by die casting. It is the best and most common method of producing them.

And what about some of the big shroud components that are used on washing machines. Once they were the exclusive product of the stamping industry, but die castings now provide greater stiffness at lower cost.

New products? Yes, it is doubtful if some of the new products of recent years could be placed on the market at anything approaching their present low price if it were not for advancements in the die casting industry. That includes such devices as the oil valve bodies used in automatic transmissions.

Size and complexity are not the only aspects of die casting that have been developed. The small die casting has taken over many jobs that were once turned out on automatic screw machine; and new alloys permit the use of die castings where special properties are needed.

One of the most recent technical advances in the die casting industry was announced this Summer by engineers of the Doehler-Jarvis Division of National Lead Company in conjunction with Kaiser Aluminum & Chemical Corp.



First die casting machine built by Herman Doehler more than 50 years ago (inset) weighs about the same as the dies for the new 72-inch machine. The old model, incidentally, is still in working order.

This is the "72-inch die casting machine" which extends the size range of die castings to 75 pounds in aluminum, up to 200 pounds in zinc. Previously, maximum size of die castings was about 20 pounds in aluminum, 45 pounds in zinc.

What will it permit? Although the test piece now running on the machine is a 41 pound aluminum flange for cable reels, company engineers talk of the possibilities for die cast motor blocks, rear deck lids, instrument panels, door frames and other large pieces that are presently cast iron or stamped steel.

The machine was conceived nearly five years ago and required more than two years to build. Although primarily designed for aluminum and having the automotive market in mind, the machine can also be used to die cast zinc.

A. F. Bauer, chief engineer of Doehler-Jarvis, who has been in charge of developing the machine, estimates that on a casting job weighing 75 pounds in aluminum, the 72-inch machine (72 inches between tie bars) could operate at a production rate of 30 shots per hour and would consume in excess of 2,250 pounds of metal per hour. To cope with this high rate of metal consumption, the machine has been equipped with two 12,000 pound reverberatories which alternate as breakdown and holding furnaces.

One of the important production features in this machine is an automatic ladle capable of handling the large movement of metal from furnace to shot sleeve. Maintaining temperatures has been accomplished by putting temperature controls in the ladle itself.

Some of the pertinent data concerning the large machine are presented in the accompanying table.

Injection time for 40 pounds of aluminum is .22 second, although it takes 2½ seconds to pour 40 pounds of aluminum into the shot chamber.

Two difficult problems were lubricating the die quickly between shots and removing the large castings from the dies.

Special features of the machine include double tangent toggles for wider opening; central water hydraulic system with triplex pumps.

SPECIFICATIONS FOR THE 72" DIE CASTING MACHINE

Size of Die Plates	105" x 105"
Diameter of Tie Bars	12"
Number of Tie Bars	4
Space Between Tie Bars	60"
Tie Bar Centers	72"
Minimum Die Space	36"
Maximum Die Space	66"
Minimum Die Opening	20"
Maximum Die Opening	36"
Closing Cylinder Diameter	11½"
Locking Pressure on Die	2,000 Tons
Shot Cylinder Diameter	8"
Shot Plunger Diameter	6"
Shot Plunger Stroke	38"
Injection Pressure on Metal	6,200 psi
Line Pressure	3,500 psi
Weight of Machine	430,000 Lbs.
Floor Space for Machine Only	10 Ft. Wide x 44 Ft. Long

Automatic Cycle or Manual Controls.
Automatic Controls for Metal Temperatures for Furnace and Ladle.
Automatic Recording for Water Cooled Shot Sleeve Temperature.
Automatic Recording for Die Temperature.

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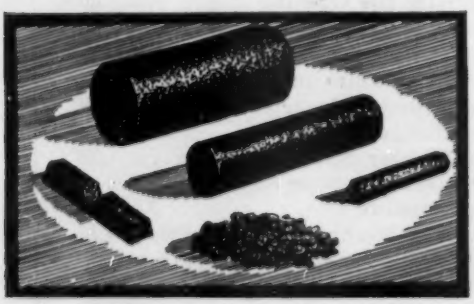
...for fast delivery of standard or custom certified* alloys for remelt or reprocessing!

CANNON-MUSKEGON regularly produces a wide range of certified alloys to maintain one of industry's finest stocking programs. Immediately available are stainless steels in the 300 and 400 series *plus* certain carbon steels.

Service on "special" alloys is remarkable too!

Preparation is begun immediately after your specifications are received. You get *exactly predictable* physical, chemical and electrical properties to your specific requirements. And, depending upon the form you order, alloys can be cast, forged, extruded and machined. Furnished regularly to investment casting foundries and other users are alloy tool steels, ferritic and austenitic stainless, alloys of cobalt and nickel-base, plus aeronautical-types for extreme high temperature applications.



MasterMet alloys are available in ingot, shot, billet or short (6" dia.) cast bar forms and are normally shipped in drums. Specifications, weight, lot and customer's order number are clearly imprinted on container, making selection and storage a simple matter.

*Cannon-Muskegon furnishes notarized certificates of analysis to meet prescribed metal specifications. For more information about this, and complete technical service, write for New MasterMet Bulletin.

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MASTERMET

METALLURGICAL SPECIALISTS

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OPPORTUNITIES

FOREMAN — DIE CASTING — 5 to 10 years direct supervisory experience Permanent position with nationally known company in suburban metropolitan New York area. Supervise and be responsible for department of 50 people, zinc and aluminum machines.

Man between 30-45 years old with broad experience in die casting — individual piecework system.

Send complete resume, stating salary desired. Will relocate properly qualified individual. Write Box No. 9154 PRECISION METAL MOLDING magazine.

FOR SALE: Kux 500 ton HP 35 aluminum die casting machine — used approximately 6 months. Write or call J. G. Gokey, Structo Mfg. Co., Freeport, Ill., Phone Main 4200.

FOR SALE — one American Pulverizer Co. No. 2400 metal turnings crusher. One Dings magnetic separator 36" wide with standard electronic rectifier from 440 V to 230 V DC output.

One industrial heating equipment Co. 30" x 20 ft. chip dryer complete with gas burner, motor, valves, etc. All equipment in excellent condition.

Contact direct — Johnson Motors, J. L. Rayniak, Waukegan, Illinois.

LETTERS TO THE EDITOR

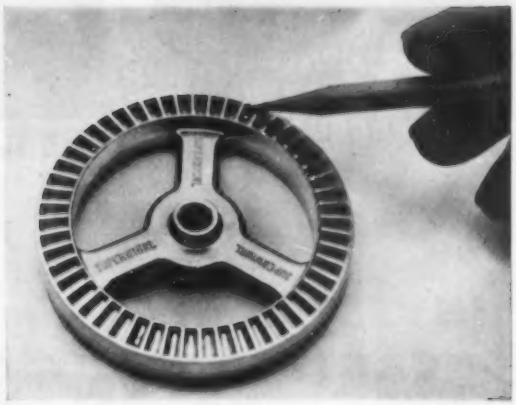
continued from page 10

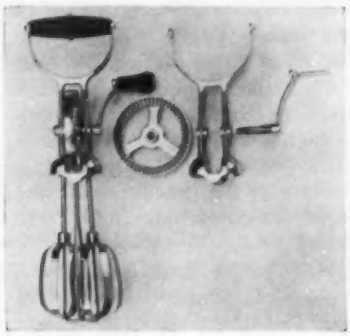
was of great interest to us, since we have a small permanent mold shop producing parts for our coin operated vending machines. We are particularly interested in information on meehanite as a material for making molds. Will you please send us the complete address of Meehanite Metal Corp., in order that we may contact them directly for samples and literature? — F.E.S.

Information concerning sources, addresses and general data are gladly forwarded. These inquiries are typical of many received by PMM each month. — Ed.

A Die Caster Demonstrates

How Small Design Changes Can Improve Plating Quality





Metal flow within a die cavity determines quality of surface. By increasing wall thickness, and improving venting to remove entrapped air, better surfaces have been obtained.

THE marked influence that both part design and die design can have on the porosity and surface finish of a die casting is clearly illustrated by the three zinc die cast parts used by the Turner & Seymour Mfg. Co.

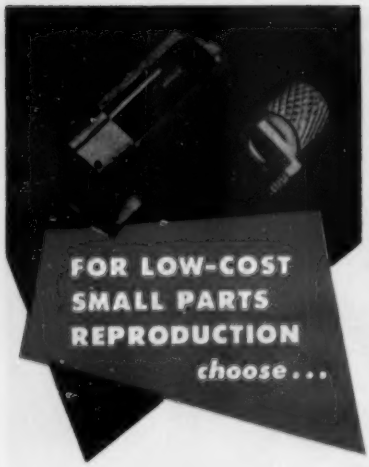
On the egg-beater shown, the main frame, the crank and the driving gear are die castings. All parts are polished and chromium plated for both longer life and for customer eye appeal. As originally designed, the drive gear production had an excessively high rate of rejects due to pin holes, porosity, heat marks and cold shuts.

When the problem was thoroughly analyzed by engineers at Precision Castings Co., Inc., they concluded that the shroud encircling the drive gear was too thin to allow proper filling before the metal solidified. Naturally such a condition would lead to all of the troubles encountered in finishing the gear.

The gear was, therefore, redesigned with a heavier shroud and, at the same time, the dies were changed insofar as gating and venting were concerned. The result of these two changes, both relatively minor, was all that had been anticipated.

A dense casting is now consistently produced that is free of pin holes, cold shuts and heat marks. Casting quality is sufficiently good that only minor buffing and polishing is required to give a thoroughly adequate finish.

However, for customer appeal only, chromium plating is still done. A standard plating procedure can be followed now. The die cast parts are electrolytically cleaned then rinsed and given an acid dip. Following a thorough rinse the die castings are plated using usual practice of copper, nickel and then chromium. Frames and cranks are, of course, given the same treatment.



INVESTMENT CASTING

Because with this economical process you can cast intricate, undercut parts to meet exacting requirements as to tolerances and finish without costly machining and assembly operations.

Keep the investment casting technique in mind when designing new products or improving old ones. It's the ideal, low-cost way to produce functional parts in their "natural" shapes needed to improve product performance and appearance.

We'll be glad to assist you in planning your own investment casting department or to recommend casting firms equipped to serve your needs. This service will not obligate you in any way.

SEND FOR THE INVESTMENT CASTING STORY

This free 12-page booklet – "MODERN PRECISION INVESTMENT CASTING" – contains informative data on how and where the process can be used.

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Precision Casting Equipment and Supplies
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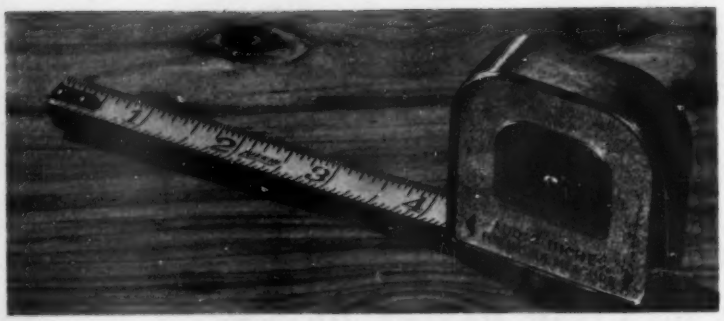


RULE CASE for steel tape is made of chromium plated die cast magnesium.

MAGNESIUM DIE CASTINGS

continued from page 59

of the weight and speed of the impeller. Obviously, light weight magnesium permits more rpm than any other metal.

Standard application of magnesium in small aircraft wheels, folding chairs, motor generator end bells and other equipment is continuing at an increasing rate. The physical advantages of magnesium in combination with a price competitive situation has inspired leading manufacturers in all fields to study the use of magnesium die castings in their products.

Die Casting Procedure

Alloys: The most commonly used magnesium die casting alloy is Dowmetal RC or ASTM AZ91B — 9% aluminum, .7% zinc, .3% copper, remainder magnesium. In some military applications the maximum allowable copper is .10%, so the special alloy, Dowmetal R or ASTM AZ91A, is used. The presence of .0003 to .001% beryllium in magnesium die castings has been found to reduce oxidation of the molten metal and can reduce normal melting loss by as much as 30%.

Melting; Magnesium is usually melted in cast steel pots heated by gas, oil, or electric resistance methods. Ingot can be fed directly into the casting pots at the machine; however, a central melting room for scrap recovery and metal preparation is much preferred. The casting machine pot usually is equipped with a dome or shell in which a non-oxidizing atmosphere such as sulfur dioxide is maintained. Casting temperatures for the metal range from 1150 F to 1250 F.

Magnesium does not possess a chemical affinity for iron and steel and thus permits automatic metal handling through steel pipes, valves and pumps without metal contamination.

Casting: The latent heat content in a given die casting is lower in magnesium than in the other die casting metals. Therefore, with equivalent machines and dies, magnesium die castings will cool faster, can be removed from the die sooner, and thus will show a higher production rate. Magnesium will not solder to the die so die coating solutions are not necessary and lubrication of the die need not be as frequent as with the other metals. With this freedom from soldering, magnesium can achieve complex coring, excellent dimensional accuracy and comparative freedom from die maintenance.

In the United States, most of the magnesium die castings are produced in the conventional cold chamber machines, ranging from 100 to 1,000 ton capacities.

Injection pressures on the machines range from 2000 to 30,000 pounds, although the majority of castings are made in the 5000 to 10,000 pound range. Injection plunger speeds for magnesium are slightly higher than those used for aluminum and are possible because of magnesium's lower heat content.

Die steel and die practices for magnesium are quite similar to those used for aluminum. Generally speaking, dies used for aluminum can be converted to magnesium use through minor adjustments in the runner and gating arrangements.

Finishing Magnesium Die Castings

One of the most important developments in finishing magnesium die castings has been the plating process. This process, utilizing a zinc immersion bath prior to the normal plating cycle, provides a wear-resistant or decorative finish equal to any of the other plated metals. The new process has been used on several commercial applications with one job running as high as 12,000 units per day with excellent results.

Two new anodic coatings, HAE and the Dow #17 anodyze, provide excellent corrosion resistance as well as good abrasion resistance. Several new paints and paint systems have been developed for magnesium which provide good adhesion and excellent wear and corrosion resistance.

The Future

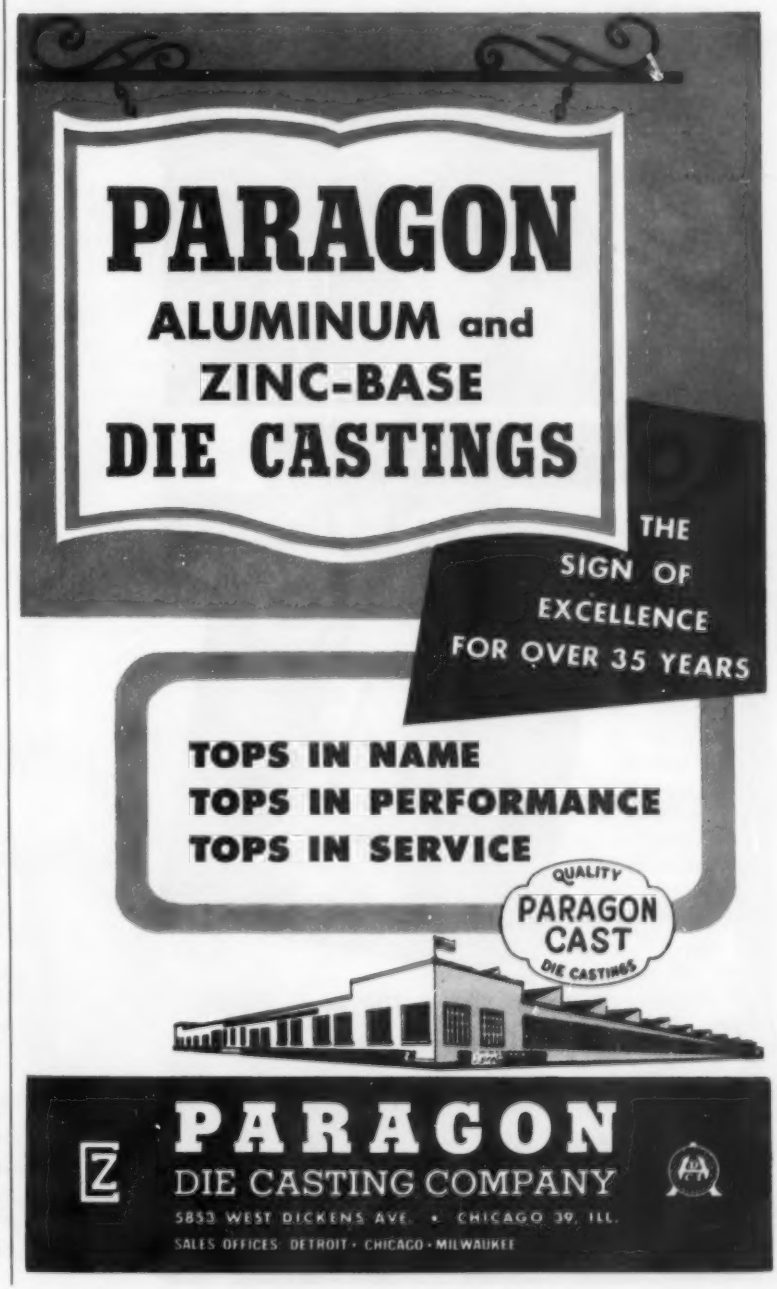
Present trends indicate that more and more parts will be die cast in magnesium. A tremendous expansion is indicated in the automotive field, dependent, naturally, on the competitive situation. As the automotive companies become more familiar with magnesium, new parts will be made in this metal.

Household equipment will be made lighter and better through the use of die cast magnesium parts. New equipment will be added to the line that now includes vacuum cleaners, sewing machines, mixers.

Any tool or piece of equipment that must be moved or transported in order to utilize it provides a natural place for magnesium. Magnesium can be used on reciprocating parts in machinery to reduce inertia and lower power costs. Business machine manufacturers are finding the economies of magnesium attractive along with the added advantages of light weight and ease of manufacture. Magnesium has made the portable dictating machine truly portable.

MOVE CHICAGO OFFICE

The Cleveland Automatic Machine Company of Cincinnati, Ohio, has announced the move of its Chicago district office from 20 North Wacker Drive to 6429 West North Ave., Oak Park, Ill. The company manufactures die casting machines and automatic screw machines.



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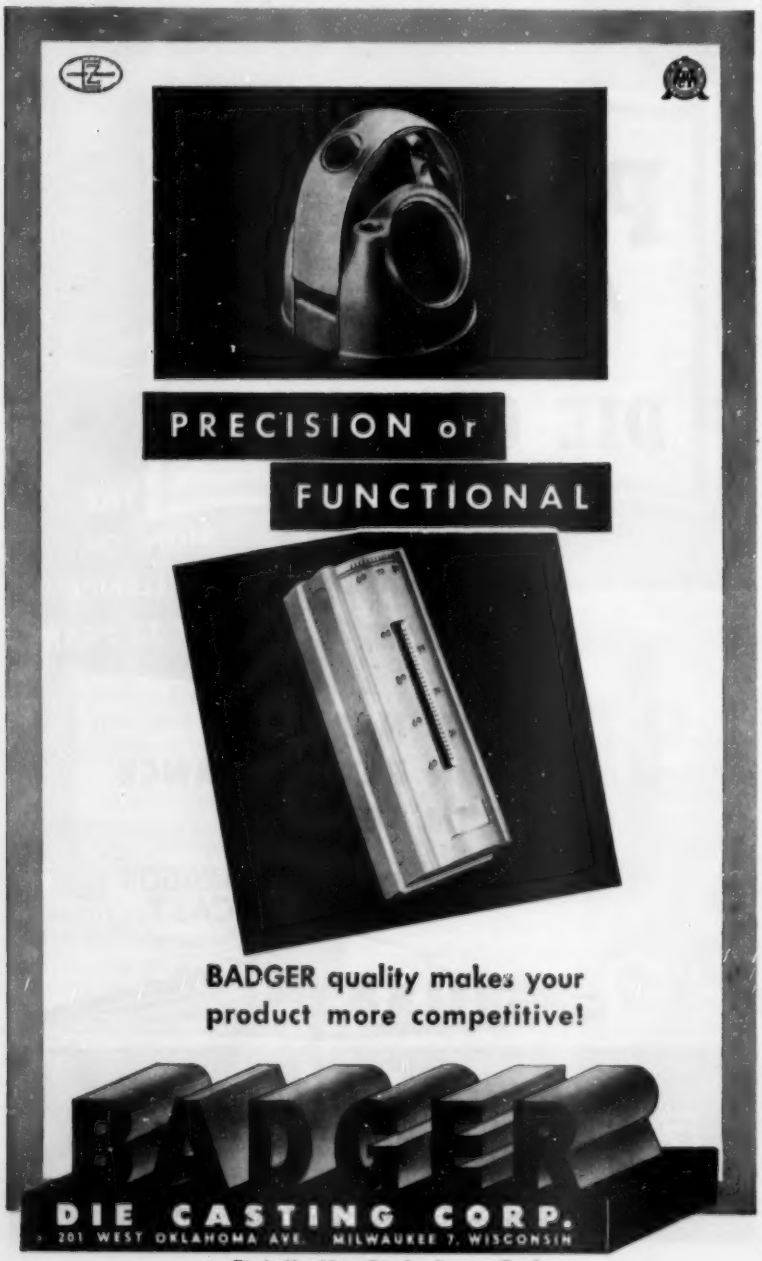
PANGBORN CORP. PLANS TWO-DAY GOLDEN ANNIVERSARY EVENTS

Pangborn Corp., Hagerstown, Md., manufacturer of blast cleaning and dust control equipment, has announced the program of events which will take place September 1 and 2, 1954 in celebration of the 50th Anniversary of its founding.

The official anniversary date, September 1, will be marked by an open-house at the Pangborn plant to which the public is invited. Beginning at 12 noon and continuing until 4 P. M. tours will be made through all departments with work proceeding as usual. At 5 P.M. all Pangborn employees and visitors will gather on the lawn in front of the main office building where an employee of the company will officially unveil a tribute to Thomas W. Pangborn and his brother, John C. Pangborn, founders of the corporation, as a gift from all employees.

Tuesday evening, September 2, will be Employees' Night and a special program of entertainment has been arranged and will be presented in Pangborn Park located near the plant.



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HOW TO HOLD BERYLLIUM COPPER MOLD COMPONENTS FOR GRINDING

A unique method for holding beryllium copper mold components to magnetic chucks on grinding tables with pressure-sensitive tape has simplified a tricky finishing operation for the R. and F. Findings and Manufacturing Company of Buffalo.

The method — developed by the firm's Walter Ruff—received its initial use on a "Tru-Cast" mold component pressure-cast by Manco Products, Inc., Melvindale, Mich. Three simple steps were involved.

With the new method (1) a short strip of "Scotch" brand double-coated tape is applied to the grinding table's grease-free surface; (2) the operator peels off the protective paper liner to expose the tape's other adhesive surface; and (3) then he sets the mold component in place on the tape. The casting remains securely in position on the tape throughout the grinding process.

Previously, because the magnetic field had no effect on the beryllium copper, clamps were used to hold the castings in place on the table. Though satisfactory, the clamping method is not as fast or convenient for mass production work.

PLAN LONG TERM PROGRAM

The Winder Aircraft Corp., Winder, Ga., is working on a long range program in the electronic and guided weapons field which will carry forward for a period of several years.

At present, Winder Aircraft Corporation is acquiring a quantity of specialized electronic research and test equipment, as well as hiring a number of engineers and technicians.

Industry News

Companies · Plants · Associations

NEW STANDARD AVAILABLE FOR ELECTRONIC CORES

A new standard for electronic cores has been made available by the Metal Powder Association after adoption by MPA's electronic core standards subcommittee and approval by the standards committee and board of directors.

The new standard 17-54T, Tentative Acceptance Standards For Electronic Cores, can be obtained for 25 cents from the Metal Powder Association office, 420 Lexington Ave., New York.

The standard specifies acceptable quality levels and defect classifications for use by both consumer and vendor as a means of setting common acceptance standards.

ORIGINAL FOUNDERS BUY KOBE, INC.

Kobe, Inc., newly organized by the founders of the original company of the same name has purchased the business and facilities of the Kobe Division of Dresser Equipment Company. General office and plant of the new company will remain in Huntington Park, Calif.

Announcement was made by the president of the new company, C. J. Coberly.

Other officers of the company include C. James Coberly, Jr., vice-president and general manager, and Harry C. Gunetti, vice-president for manufacturing. James Coberly was previously president of Surface Alloys, Inc., and Mr. Gunetti has been vice-president of Joshua Hendy and most recently the manufacturing vice-president of Locomotive Finished Materials Co.

Under this re-organization, Surface Alloys, Inc. becomes a wholly owned subsidiary of the new Kobe, Inc.

C. J. Coberly C. J. Coberly, Jr. H. C. Gunetti

F. K. IVERSON NAMED CHIEF METALLURGIST BY CANNON-MUSKEGON

Appointment of F. Kenneth Iverson as chief metallurgist of the Cannon-Muskegon Corp., Muskegon, Mich., has been announced by George W. Cannon, Jr., president.

Iverson, 29, has had several years' experience in his field,

F.K. Iverson

having most recently served as metallurgist on special assignments for the Indiana Steel Products Co., Valparaiso, Ind. His work with the Indiana firm involved research on production of permanent magnet materials. Before that he was metallurgist and chief engineer for the Illium Corp., Freeport, Ill., where he worked directly under the president in production planning, research and development, technical sales and design and installation of new equipment.

From 1947 to 1952, Iverson was a research physicist in the manufacturing research department of the International Harvester Company, Chicago. The majority of this time was spent in the application of metal-

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No matter what your die casting requirements may be, Central has the facilities, the equipment, the experience and trained personnel to produce castings to meet your rigid specifications. Take advantage of Central's complete facilities and be assured of prompt economical service on the best castings made.

- Complete engineering and design service
- Die and tool making
- Most modern production equipment
- Research and quality control facilities
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May we help you with your production requirements.

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lography, radiography, electron microscopy, x-ray diffraction and spectroscopy to research in ferrous metallurgy.

Iverson attended Northwestern University, Cornell University and Purdue University. He prepared his thesis at Purdue, on "Modern Metallurgical Applications to the Fabrication of Internal Combustion Engines." He also studied at the Illinois Institute of Technology.

Iverson is the co-author of three technical papers. They include "Quantitative Metallography with the Electron Microscope," "A Method of Linear Analysis with the Electron Microscope," and "Metallography with the Electron Microscope," published by the Electron Microscope Society of America and the American Society for Testing Materials.

OPENS ROCHESTER OFFICE

Acheson Colloids Co., Port Huron, Mich., division of Acheson Industries, Inc., has an-

DIE CASTING DIES
FOR ZINC AND ALUMINUM

Complete engineering and tool room facilities for designing and building of die casting dies and plastic molds.
Highest standards of workmanship and skill go into the building of quality dies. Quality service a specialty.

Send your designs or samples for prompt quotation.

DAMEN TOOL and ENGINEERING Co.
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• CHICAGO 14, ILLINOIS

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PRECISION METAL MOLDING

nounced the opening of a Rochester sales headquarters. E. A. Lampman, service engineer, is territorial sales supervisor for Western New York and Western Pennsylvania, and will be in charge. This new Acheson Colloids office is located at 545 Powers Building, Rochester, N.Y., telephone, Locust 9017.

ALFRED SUGAR NAMED ALLOYS & CHEMICALS EXEC

The appointment of Alfred Sugar, until recently aluminum division plant manager for the American Metal Co., Ltd., as vice-president and technical director of Alloys & Chemicals Mfg. Co., has been announced by N. L. Butkin, president of the Cleveland firm.

The author of many technical papers and college lecturer, Mr. Sugar has had almost 30 years' experience in metallurgy. In his last position, Mr. Sugar not only was responsible for the engineering, building and operating of the aluminum division, but he also was in charge of technical sales and customers' service. He conceived and engineered the zinc die cast operation at Pittsburgh and was in charge of technical sales of special high grade zinc. Mr. Sugar developed the application of OFHC copper as an anode for plating.

Alfred Sugar

At the request of the War Production Board during World War II, Mr. Sugar lectured at Stevens Institute on "Die Casting," and "Permanent Mold Casting." The lectures were published in book form, and have been adopted by the American Foundrymen's Society as recommended practice.

A graduate of Case Institute of Technology in 1925 with a degree in Chemical Engineering, Mr. Sugar was affiliated with Thompson Products, Inc., from 1925 until 1936 as chief chemist. He was responsible for the installation of aluminum foundries in Cleveland, St. Catherine, Ont., and in other cities.

From 1936 to 1939 he was with U. S. Reduction Co., as metallurgist, during which time he patented one of the first commercial methods for the removal of magnesium from aluminum alloys. He also published a paper on steel mill aluminum. He was associated with Monarch Aluminum Mfg. Co., as plant metallurgist from 1939 until 1943.

DESIGN FIRM GROWS

Sundberg-Ferar, industrial designers with offices in Detroit and New York, have announced

here's how
to end your SMALL PARTS problems

GRC DIE CASTINGS

GRC VERY SMALL zinc alloy die castings are made by our unique process in one high-speed, low-cost automatic operation.

AT THE MODERN GRC PLANT

. . . the big factory small parts built . . . producing over a million die castings daily. GRIES' expanded capacity . . . together with GRIES' unlimited design flexibility . . . make possible extremely low costs on high quality parts. You too can effect BIG economies with GRC VERY SMALL PARTS.

Die Castings } Maximum Weight, ½ oz. Maximum Lgth. 1¾"

WRITE for bulletin and samples today.

Send prints for quotations on quantities of 100,000 to millions.

GRC

GRIES REPRODUCER CORP.

— World's Foremost Producer of Small Die Castings

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the recent addition of four new designers to the firm's headquarters staff.

They are: Ernest C. Brown, formerly a designer with west coast companies; Garabed C. Dadian, formerly with styling section of General Motors Corp.; Robert W. Schier, formerly a product designer with Servel, Inc., Evansville, Ind.; and Y. Alan Shimasaki, formerly with Raymond Loewy & Associates and with styling section of Ford Motor Co.

POWDER METAL SYMPOSIUM ARRANGED IN LONDON

The British Iron and Steel Institute, in association with The Institute of Metals, is organizing a Symposium on Powder Metallurgy, to be held Wednesday and Thursday, December 1-2, 1954, in Church House, Westminster, London, S.W. 1. On both days morning and afternoon sessions will feature discussion of the papers, which will cover both ferrous and non-ferrous aspects of powder metallurgy. A small exhibition of powder metallurgy components is being prepared.

The arrangements are being made by the organizing committee: Dr. Ivor Jenkins, General Electric Co., Ltd. (chairman); L. J. Brice, Minister of Supply; Dr. W. D. Jones, consultant; D. A. Oliver, B.S.A. Group Research Center; Dr. L. B. Pfeil, Mond Nickel Co., Ltd.; Dr. T. Raine, Metropolitan-Vickers Electrical Co., Ltd.; E. Tobson, Manganese Bronze and Brass Co., Ltd.; K. Headlam-Morley, Iron and Steel Institute (secretary).

A large number of papers is being specially written for the Symposium, and will be presented and discussed in the following three main groups:

I. Metal Powders and their Assessment.

II. Research and Production Practice.

III. Production and Properties of Engineering Materials.

The papers, together with the proceedings and discussion, will subsequently be published in a bound volume.

The symposium will be open to all interested in powder metallurgy, whether members of the Iron and Steel Institute and Institute of Metals or not, and an invitation to take part in the proceedings has been extended to members of the Faraday Society, The Institute of Physics, The Institution of Electrical Engineers, The Institution of Mechanical Engineers, The Institution of Metallurgists, The Institution of Mining and Metallurgy, The Institution of Production Engineers, The Physical Society and the Society of Chemical Industry.

Further particulars, the program of the meeting and a form of application can be obtained from the secretary, The Iron and Steel Institute, 4 Grosvenor Gardens, London, W.W. 1.

are reasons why SCOTT-ATWATER uses ACCURATE die castings

■ Because of their uniformity and light weight, ACCURATE die castings greatly reduced the time required for handling and assembly. Cast to close tolerances, they reduced or eliminated machining operations, special tooling and scrap loss. In addition, a more dependable and efficient motor was produced with die castings that have high strength-light weight properties and are non-porous and leakproof. Perhaps you too, can improve your product and profit picture with ACCURATE die castings. Write, wire or phone if you have a parts problem demanding immediate attention.

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OPENS SOUTHWEST OFFICE

The opening of a Southwest sales office serving Texas, Arkansas, Oklahoma, and Louisiana, has been announced by Acheson Colloids Company, Port Huron, Mich., manufacturers of 'dag' colloidal graphite dispersions.

Clifford T. Olsen, service engineer for Acheson, will manage the new office, which is located in the Suburban Building, 5526 Dyer Street, Dallas 6, Texas.

Mr. Olsen joined Acheson Colloids Company following his association with Hanson-Van Winkle-Munning Co. and the Automotive Rubber Co. After completing a tour of duty with the U. S. Navy during World War II, he was graduated from Lafayette College with a Bachelor of Science degree in Metallurgical Engineering.

TWO FIRMS CHOSEN TO EXPAND PLANT

National Lead Company has announced the selection of the firms to perform the construction necessary to expand the nickel plant at Nicaro, Cuba.

The firms are the Frederick Snare Corporation and the Merritt-Chapman & Scott Corporation, both of New York, N.Y., and Havana, Cuba. They will participate jointly in the construction.

National Lead Company made the selection as the operating contractor. The General Services Administration, by directive from the Office of Defense Mobilization, is responsible for both the operation and the expansion of the nickel plant.

The Office of Defense Mobilization has authorized the investment of up to $43,000,000 for the overall task of enlarging the capacity of the Government-owned installation by 75 percent. The expansion program was announced earlier this year, and the necessary planning and engineering phases of the project have been advanced as an essential preliminary to choosing the firms qualified to undertake the construction.

POWDER METALLURGY GROUP HEARS LENEL

The Detroit Powder Metallurgy Society met recently to hear a paper by Dr. F. V. Lenel of Rensselaer Polytechnic Institute on Liquid Phase Sintering. This local group has nearly 100 members in the Detroit area who are interested in the production and use of parts by powder metallurgical processes.

AMERICAN BRAKE SHOE BUYS METALLIC FRICTION COMPANY

American Brake Shoe Company of New York has agreed to buy Metallic Friction Materials Company of Cleveland, it has been announced. The Cleveland company who produced powdered metal friction materials, will be operated with its present personnel as part of the Sintermet Division of American Brake Shoe.

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TECHNICAL REPORT

The Influence of Metal Structure On Properties of Investment Castings

By DR. NICHOLAS J. GRANT, Department of Metallurgy
Massachusetts Institute of Technology

Part 1

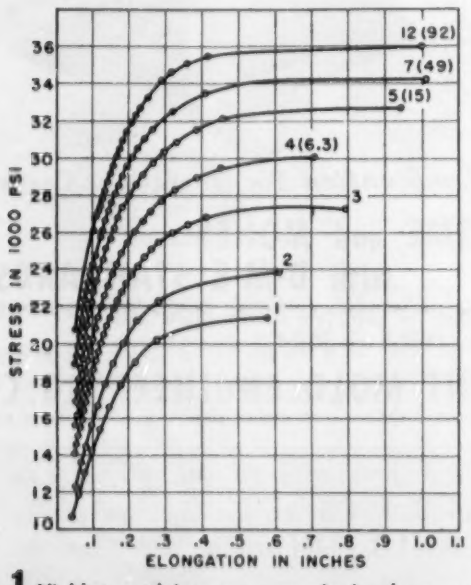
WHILE I am going to talk about specific cases to point up the importance of metal structures and metal properties obtained in investment casting, I do not wish to suggest to you that there aren't important exceptions to these rules.

When you accept a precision casting job, there are a number of specifications you may have to meet. You may have to meet one of them, you may have to meet more than one of them.

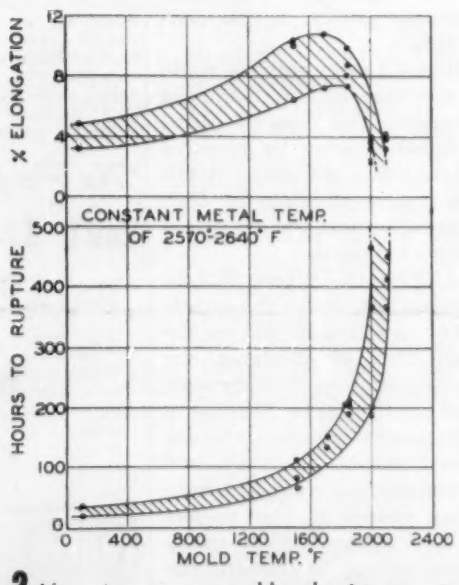
This may include the mechanical properties of the alloy, therefore, the structure is important; it may include only the dimensions that have to be met; in may include both. The specifications will also call for a surface requirement, and, of course, almost always it will call for "soundness".

"Soundness" will vary. It may be *surface* soundness or it may be *X-ray* soundness just as well. You don't have to meet all of these specifications in all instances, but more likely than not you have to meet a number of them.

Let's take a look at the first of these, namely, the mechanical properties (and properties are always related to the strucutre). If we go back to our undergraduate metallurgy days, a number of items stand out; one



1. Yield strength increases as grain size decreases.



2. Hours to rupture vs mold preheat temperature.

of these is that, in order to control structure, you have to control the manufacturing conditions. In the case of precision casting, we might refer to the manufacturing conditions as the metal and mold casting temperatures.

One of the first things we learn is that, for a fine grained structure (and generally, for low temperature applications, fine grained structures are desirable), it can be obtained by control of metal and mold casting temperatures in such a way that the solidification rate is fast.

The fine grained structures are stronger; they are also harder and have better fatigue properties. On the average, they have better corrosion properties, too. If you are only concerned with low temperature applications, this would be simple and you would have to aim, wherever necessary, to get a fine grain size.

On the other hand, there are applications which have become important, especially since about 1940, which call for high temperature, high stress service. This would include, of course, all the jet engine, gas turbine and steam turbine materials.

For an application of this type, a coarse grain size may be preferred. You will not, however, always be asked for a coarse grain size simply because it is a high temperature application. If the application calls for a simple tensile or compressive type of load, we know now, from many tests, that the coarse grained alloys, on the average, are significantly stronger than are the fine grained alloys. This may not, however, be true if the application calls for a fatigue type of loading.

It is our experience, from many tests that have been run in fatigue at high temperatures, that, because of the high strain rates that are involved in loading and unloading, a fine grained structure will be superior to a coarse structure.

If you consider a jet engine bucket, the optimum grain size is difficult to specify because the failure may be due to stress rupture limitations, fatigue limitations, or, as happens frequently, one finds both types of failures in one engine.

A compromise may have to be worked out in selecting the optimum grain size. This means that a medium grain size is most desirable for the specific engine; a structure which is stronger than a fine grain size and yet not so coarse grained that one would get into difficulties from fatigue limitations. This could be and has been worked out.

Figure 1, taken from Carpenter and Robertson, shows the very simple fact that, at low temperatures, the yield strength or the tensile strength, increases as the grain size decreases. The number next to each of these tensile curves, represents the number of grains in a cross-section of a test specimen. You will see that the lowest, weakest curve shows only one grain in the cross-section; the next curve shows two, the next one shows three, etc. Finally, when we get up to the curve for the strongest test specimen, the number of grains in the section is considerably larger (fine grain size) and it is apparent that the yield strength and the tensile strength have improved markedly with decreasing grain size.

This behavior is well known, but it is put in here to emphasize the point that, for low temperature applications, one prefers a fine grain size.

The results shown in Figure 2 are obtained from our own experimental program, using a cast stellite type of alloy in which we varied the mold temperature at a constant metal pouring temperature. The graph shows the

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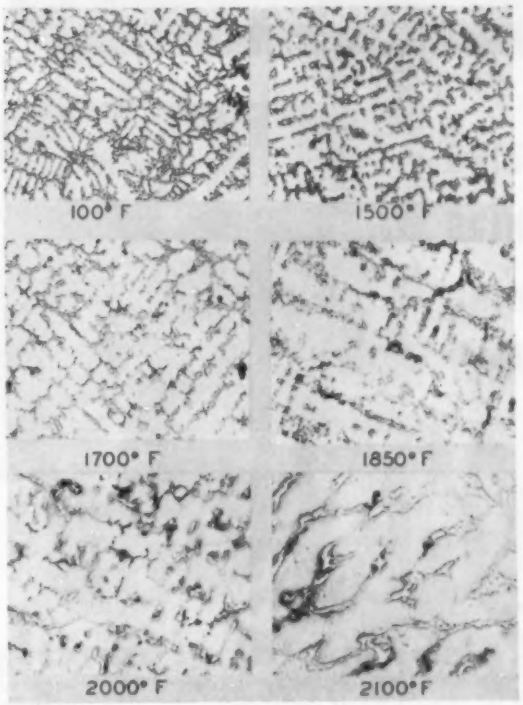
Tests on Stelite Alloy By Merbasting



3. Change in metal structure as mold preheat temperature is changed. Note the variation in grain size in investment cast turbine blades.

Editor's Note: This paper is based on a report delivered before a meeting of the Investment Casting Institute in May.

hours to rupture versus the mold preheat temperature. These data are from tests which were run at 1500F at a stress of 30,000 psi. Note that the lowest rupture life value was obtained with a mold temperature of 100F. This gave a very, very fine grained casting.

Two duplicate tests gave values as shown by the two points on the graph. These values were quite low and are in a range of 20 to 40 hours.

The next mold preheat temperature was of the order of 1500F and the rupture life values are higher for this coarser grained casting.

The rupture life values are now in a range of about 70 to 110 hours. For an 1800F mold preheat temperature, the rupture life increases to about 200 hours. Finally, for a mold temperature of 2200F, which is about as high as you can go without getting into all kinds of refractory difficulties, we obtained rupture life values under these same test conditions up in the range of

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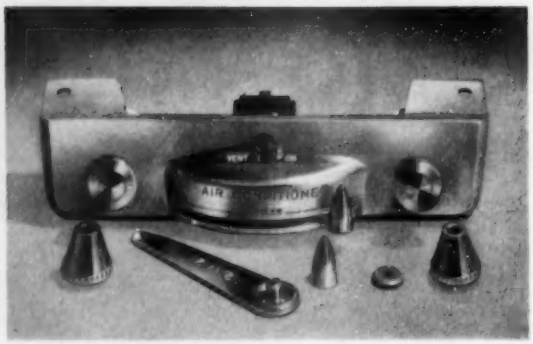

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about 400 hours, corresponding with an extremely coarse grain size.

There is one important item to point out, namely, when casting conditions result in this extremely coarse grain size, there is danger of encountering single crystals in the specimen cross-section. When this happens, rupture life test results may vary rather widely. In Figure 2, the 2000F preheat temperature gives some values which are as low as 200 hours and some values as high as 450 hours.

Single crystal test bars from this same alloy have also given rupture life values of 1500 hours or 70 times stronger than the test values from the very fine grained specimen from the 100F mold. That happened to be for a single crystal specimen in which the orientation for that particular grain offered maximum resistance to deformation and fracture.

In extremely coarse grained structures, more variation in properties occurs because where there are only a few grains in a cross section of a casting, it is subject to variations in properties due to the orientation of the grains.

So, for practical reasons, if you are seeking a coarse grained structure, you may have to compromise at a point where there are at least ten to twelve grains in a cross-section in order to avoid severe grain orientation effects.

Nevertheless, by going from a fine grain size to a coarse grain size, you can change the rupturing life for this particular alloy from about 20 or 30 hours up to something on the order of 200 to 400 hours. This has been done in many instances.

We are currently testing a stellite alloy cast by Mercasting, using mold preheat temperatures from room temperature to 1600F and metal pouring temperatures from 2500 to 2900F. At 1500F rupture life differences from 2 hours to over 20 hours have been measured, again a factor of over 10 in the rupture life as the grain size and other structure factors are varied. Let me point out that these casting conditions can be reproduced and, through such reproduction, the properties can also be reproduced for any given structure.

Figure 3 illustrates the change in structure as the mold preheat temperature is changed. In the upper lefthand corner can be seen the structure of the alloy charted in Figure 2 when the metal is poured into a 100F mold. This is a cold mold that had been baked out initially at 1500F and cooled to 100F.

What you see here is a carbide structure, a carbide network of a dendritic nature, in an austenitic matrix. You will see that the carbides look quite continuous and the austenitic path is not continuous. The ductility of this alloy is not too good for this reason, and the tensile strength, too, is not too good. Gradually, then, as the mold temperature

Continued next page

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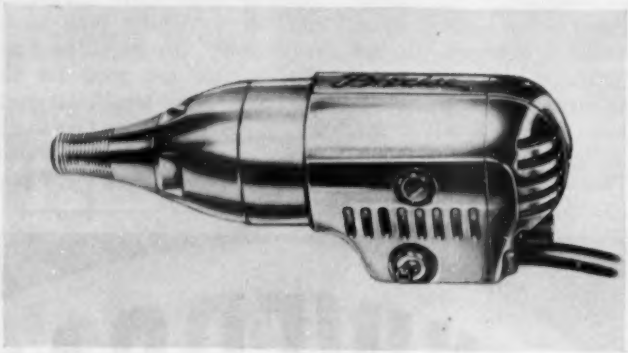

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is raised to 1500, 1700, 1850, 2000 and 2100F, the space between the carbides begins to increase. Note, too, that in the 2100F mold, the austenitic path is now the continuous path. This latter structure in the stress rupture test definitely showed higher ductility as well as higher strength.

All of this can be done in a more pronounced way by varying the metal pouring temperature over a wide range. Thus the structures, and therefore the properties, do respond to variation in the mold and metal casting temperatures.

Let's stop now and think a little about what is going on during casting. One of the first things is that, if there is no crystallographic transformation in the alloy cooling, that is, if we are not casting a heat treatable steel alloy, then the structure obtained when the metal solidifies, is the final grain structure. The cast dendritic pattern is the structure that stays when the casting gets down to room temperature. Thus, to control the structure, you have to control it during solidification by means of the rate of solidification. Even if there is a transformation, the rate of cooling through the transformation temperature will also determine the grain size.

It is the rate of cooling, therefore, either through the solidification temperature or through the transformation temperature, which will determine grain size. If cooling through the solidification temperature is rapid, a fine grain size results; cooling slowly gives a coarse grain size.

In terms of casting temperatures, again, fine grain means relatively low mold preheat temperatures and/or low pouring temperatures (low superheat), while coarse grained structures are synonymous with high mold temperature, high preheat temperature, and/or high metal temperatures.

Editor's Note: Part two of this paper by Dr. Grant will discuss the importance of the hot mold and its affect upon metal properties. It will appear in PMM in October.

ZINC DIE CASTINGS
continued from page 54

From a design and production standpoint, the chief virtues of zinc alloys are their unusually good castability that permits production of highly complex thin-sectioned castings at low cost. This inherent characteristic has placed zinc die castings in a highly favorable position in competition with screw machine products, sand castings and stampings.

From a standpoint of die cost, dies used for casting zinc alloy are less expensive than dies for casting aluminum or magnesium and life of the dies is longer; this economy is basically due to the low melting point of zinc.

Ease of painting and plating at low cost plus strength, intricacy of shape and dimensional accuracy are basic reasons for selection of zinc alloy die castings for the decorative parts exhibited in Figure 3. The fact that zinc can be readily given a bright plate coating qualifies it for consideration whenever such appearance items are being designed.

It is not unusual for zinc die castings to be made as thin as corresponding stampings and in much more complex shapes than feasible in one-piece stamping.

Assembly Simplified

One unique advantage gained where die castings are used is the possibility of designing the parts that must be combined in assembly with integrally cast rivets on one part and mating holes on the other. The successful application of integral rivets is dependent upon the ability to hold close dimensional tolerances for consistent accurate alignment of rivets and holes. Zinc alloy die castings hold to .001 in. per in. for average conditions.

A current trend, where integral rivets are employed, has the zinc die caster performing the assembly function. The casting company assemblies the two mating halves, heads over the rivets and ships the assembly to the user as a complete unit.

It is also a simple matter to provide integral studs, shanks or bosses that can be gripped by Speed Nuts or clips or that can be threaded or tapped to receive ordinary nuts or screws.

Thread-cutting screws make use of the ability to core holes accurately as to size and location. The cored hole plus the thread-cutting screw eliminate both drilling and tapping.

External threads may be readily cast. Projections other than studs or integral rivets are used occasionally for fastening other parts. Small lugs or prongs can be bent to hold a mating part, such as a wire or spring, saving the use of an extra component or of extra machine work.

High strength, thin sections, dimensional accuracy, ease of plating or painting and the ability to reproduce complex shapes without machining give zinc die casting a high engineering potential.

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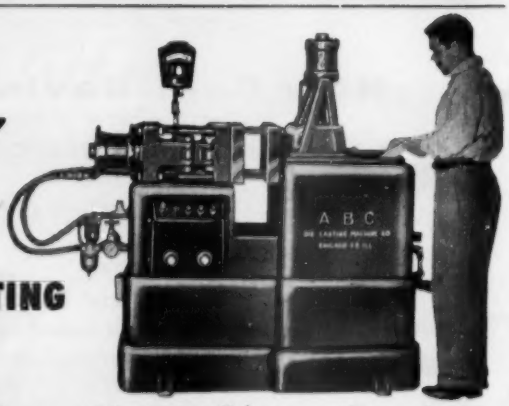

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G-E ESTABLISHES FOUNDRY FOR SHELL MOLD STUDY

Establishment of a new experimental shell-molding foundry, with complete facilities for making shell molds and pouring castings, has been announced by the General Electric Company's Chemical Materials Department.

Believed to be the most complete experimental operation of its kind in the resin manufacturing field, the G-E foundry permits study of all factors affecting shell and casting quality — not only in the intermediate area of shell mold-making but also in the final pouring of the casting itself.

S. L. Brous, general manager of the department, said that "this facility will enable G.E. to make a contribution to foundry technology in solving problems such as satisfactory casting of low-carbon steel in shell molds."

"In addition," the G-E executive said, "this experimental foundry will permit constant testing and improvement of G-E phenolic resin for the shell molding process, as well as provide trouble shooting service for foundry customers."

Shell molding, the modern low-cost method of casting smooth-surfaced metal parts to close tolerances, is being adopted by many of the nation's leading foundries. Industrial consumption of phenolic shell-molding resins is expected to exceed the 25-million pound mark by 1957; over 8 million pounds were consumed last year by the foundry industry.

G-E engineers in the experimental foundry will offer such consulting services to foundries as recommendations on casting design; pattern construction; melting and pouring procedures; shop equipment and layout; resin-sand mixtures; types of resins to be employed for best shell properties; techniques for assembling and fastening shell halves together. The experimental facility, a small-scale duplicate of shell-molding production operations, is equipped to make test shells and pour castings from customers' patterns on G-E equipment.

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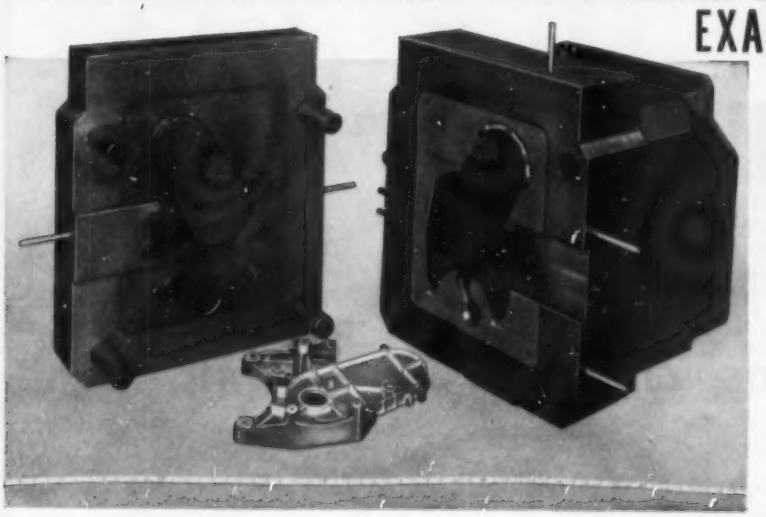

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